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PUBLISHER'S ANNOUNCEMENT.

The ELECTRICAL REVIEW has purchased the *Western Electrician*, of Chicago, and the first issue of the consolidation of these two journals, the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, will be published from Chicago on November 7, 1908.

The ELECTRICAL REVIEW was founded by George Worthington in February, 1882, and is the pioneer American electrical weekly. Since its inception consistent effort has been made to promote the development of the electrical industry, and the journal has grown and prospered, until to-day it stands thoroughly entrenched as a technical publication worthy of the interest of discriminating and thoughtful men.

The trend of events to-day is toward the establishment of absolute equities between all the people, and the publisher of a technical journal must lead in the effort to deliver to the purchaser the highest return possible for value received. It is thus with the purpose of better serving its great family of subscribers and advertisers, due to the enlarged opportunities of centralization of effort and the inevitable extension of the industry, that the ELECTRICAL REVIEW moves its publication office to Chicago and joins forces with its western contemporary.

There will be no change in the personnel, the present editorial and business organizations of both journals being continued and merged; and the present offices in New York city, supported by a strong editorial and business staff, will be maintained.

ELECTRICAL MACHINERY AND COTTON MANUFACTURERS.

The reciprocity of commerce was admirably illustrated the other day by Dr. E. W. Rice, Jr., vice-president of the General Electric Company, in his sententious address welcoming the National Association of Cotton Manufacturers to the works at Schenectady, when he said that the members of that association had been patrons of the company to the amount of $1,000,000 during the last year, and that the company had purchased cotton cloths and yarns to the same amount during this period.

This also illustrates how both parties can profit at a bargain. It is evident that the electric company sold its goods at a profit and, on the other hand, by the use of electric plant the cotton manufacturers have prospered in the application of a

method of lighting which keeps the operatives in better condition, and also makes better goods by the facility of accurate discernment of colors, and the detection of the inevitable imperfections in weaving.

Since the general installation of electricity in textile mills the old-time preference for summer-made goods over those woven in winter, whose shorter days meant artificial lighting, has vanished from the market.

The electrical transmission of power in mill yards is an economic improvement over the use of horses for the purpose. The motor for storehouse elevators has been another element which showed in the insurance rates when the use of a portable steam boiler and engine for the purpose so amplified the premiums that the expensive use of manual labor for hand hoists was indeed the cheaper.

The electric transmission of power is producing the radical change in cotton manufacturing, which has mechanically remained unaltered for nearly a generation. Cotton manufacturing is essentially an engineering problem on account of the relatively low cost of raw material to that of the manufactured product.

Like the proverbial barrel made to fit the bung-hole, the salient problem in cotton manufacturing always has been the transmission of power from the prime mover to the machines. With the progress of the water-wheels, successively of the undershot, breast, overshot and finally the turbines, with their closed trunks in place of the open trench, the positions and dimensions of the mills have been as continuously modified.

The steam engine made other changes, but with all of these the belt tower for power transmission has continued in its costly construction, expensive maintenance and large fire hazard.

Like the doctor in "La Malade Imaginâre," the introduction of electric transmission "has changed all this," and there are quiet intimations of further radical changes in electrical transmission which will force the most astounding changes in the spinning of cotton. The market has no mercy for an old mill, and the iconoclasm of new inventions in converting old machinery into junk is as inexorable as an earthquake.

These are answers to the natural question why the cotton manufacturers should interrupt the natural flow of sessions at their meeting at Saratoga Springs, from a consideration of standard specifications for staple gray goods; what is a plain weave; textile tests in Europe; cones and fliers; colors and dyeing apparatus; textile fabrics and their consumers, and other topics of like ilk, to visit an establishment for the production of electrical apparatus, and the result is that the economic principles of their New England thrift did not permit them to lose the opportunity.

This consideration of electrical questions is no new venture of the Cotton Manufacturers' association. More than twenty-five years ago it began to have papers on electric lighting in mills, and it has continued to have papers on these applications of electricity to this day, keeping to the forefront in giving a fair hearing to those who had anything to offer on the subject which would furnish a contribution toward better results or cheaper processes, and the twain have generally gone hand in hand.

The practical scope of electrical applications is illustrated by the position which this branch of their uses has occupied at these meetings, and this is only one of the many industries where these changes are progressing to the material benefit of all manufacturing interests.

THE RELATION OF ELECTRICAL ENGINEERING TO THE OTHER BRANCHES OF THE PROFESSION.

Electrical engineering, in its various forms, comes into contact with more phases of human activity than does any other branch of the engineering profession, and, indeed, it is called upon oftener by the several other branches to help solve some troublesome problem than is any other division. There is, of course, a reason for this which must depend upon some fundamental principle of electrical engineering and which distinguishes it, in some degree at least, from the other branches and which it will be interesting to elucidate.

This principle should be apparent if we divest any electrical application of all the non-essentials, of all those things which could not be replaced by something else without transferring the application to another branch of engineering. If, in doing so, we find some one feature of these applications which is common to all, it is probable that this feature is one that is largely responsible for the success of the system. When, moreover, we find that this feature is the one which has led to the substitution of the electrical system for various others in different lines of work we are justified in assigning to it the greater part of the credit for the success of all such applications. Is there any fundamental principle in electrical engineering of which this can be said?

Examination of our electric lighting systems shows us a number of new devices, each of which is undoubtedly to some degree responsible for the success of the systems. But do we find any device here which could not be discarded? The dynamo seems to be one, but should another method of producing electrical energy be found, which would be as cheap as the dynamo, the lighting system would still be electrical; and have we not been looking for such a device in the so-called carbon-consuming cell?

Turning to the other end of the lighting system we find no new principle. Light is produced by bringing a body to incandescence through the production of heat. This is the only way we have yet developed; and we have to-day a goodly variety of electric lamps, any one of which could be discarded and its place filled by another. All apparatus coming between the dynamo and the lamp could likewise be discarded, if necessary, except the wires over which the current is transmitted; yet even here we might substitute portable storage batteries by means of which the daily supply of electricity might be delivered in wagons. Since, therefore, no single element of the system can be considered absolutely indispensable,

the feature we are seeking must be a resultant of the combination. Now the combination is merely a means of transferring energy from one point to another; in the common phraseology, a means of transmitting and distributing power. In fact, the entire electric lighting system is nothing more than a means for transferring the heat units of the coal to the incandescent element of the lamp.

Do we find the same condition in the electric railway? Obviously the dynamo is no more essential here than it is in electric lighting—very necessary to-day but by no means certain to be a part of the system of the future. The electric motor is indispensable, but does it not merely constitute one step in the more important problem of transferring power from a distant point to the car axles? And is not this transmission of power from a central point to the cars the real explanation of the success of the electric railway? Other systems of accomplishing the same end have been replaced by the electric system merely because the latter has shown itself better in this respect than they.

In the field of general power distribution the same is true, and this system is replacing the local power plant because of the ease and economy with which electrical energy can be distributed from a central point. In the hydroelectric systems it is very evident that the success depends upon this feature. The utilization of water power is not new, but it is only since the development of electrical transmission that we have had a means of transferring the power of the water to a distant point where it can be utilized. The larger water powers represent far more power than a single manufacturing establishment placed on the power site can utilize; moreover, the expense of developing these powers is often greater than the amount of power needed by the factory will warrant. Hence such resources will only be developed when their power can be distributed to a large number of establishments. Electrical transmission offers the only successful means we have of doing this.

Consider a case where this fundamental principle of transmission is less apparent. The telephone seems at first an exception, yet is it not the exception which proves the rule; that is to say, does not a more careful examination of the principles of telephony show that this is only a very special case of electrical transmission and distribution? The power involved is exceedingly small in any single operation, but that does not affect the principle, nor does the fact that this power is not wanted for itself; indeed, we hardly realize that power is being transmitted. But neither do we want the electric power for itself in any of the applications of electricity. What we are after are the results of the transmission of the power: in the one case, light; in another, mechanical power, and in the third a transmission of speech. And what is true of the telephone is true of all electric signaling systems. They are nothing more than special cases of the transmission of electrical energy. We are justified, therefore, in saying that the one common and essential feature of all electrical systems is the transmission of power. The distance of transmission may be a hundred miles or only a few feet, but the principle is the same.

If, then, the principal object of the work of the electrical engineer is the transmission of power, it is clear that he must be a specialist in this work. And to be entirely successful he must specialize on all phases of the problem. Some engineers must devote themselves to the development of the best apparatus for producing and controlling electrical power in the various forms found best adapted to the manifold uses to which this power is put. Others must study the problem of transmitting this power in the most economical and reliable manner. And others, again, must give us the best devices for utilizing the electric power where delivered for producing the desired end. But all may be classed together as specialist in the production and control of power.

If we accept this classification of the electrical engineer as one who deals in the production and distribution of power, the reason for his close association with so many phases of activity is clear. In nearly all of our work power is required and the electrical engineer offers the easiest and most convenient way of obtaining this. Hence he is called in. And the relation of this branch of engineering to the others is also plain. The mechanical engineer produces machines, the electrical engineer furnishes him with the power needed for the production and operation of his machines. The civil engineer builds railroads and various structures and the electrical engineer furnishes him with the power needed in the building and utilization of these structures. He also furnishes the mining engineer with the power the latter needs in his business of producing ores and minerals. And the same relation holds with respect to the other less distinctly recognized divisions of engineering. In fact, we may fairly say that the electrical engineer has appropriated to himself the production of power, just as the other branches have each occupied a different field. This is his domain and here he should rule supreme.

ELECTRIC TUNNELING.

The use of a tiny gas flame or a platinum point heated to incandescence by a circuit has long been used to engrave glass by the decrepitation of small pieces, and this property may be used to a more practicable extent and on a larger scale in rock cutting in tunnels and mining.

A series of electric arcs on a turret at the heading is proposed for the purpose.

The first attempt to pierce Hoosac Mountain in northwestern Massachusetts was by means of a gigantic turret carrying numerous chisels, the invention of General Herman Haupt, but, after boring a hundred feet or so, the machine was abandoned and the 4.71 miles of tunnel made by drilling and blasting.

It was a long time before this tunnel was lighted by electricity, as there was not at the time any insulated wire in the market which would resist the dampness of the tunnel.

THE TEXTILE MILL POWER PLANT.[1]

LEWIS SANDERS, M. E.

The function of a textile mill being the production of goods, its power plant is naturally of secondary importance; also its construction and operation involve a line of management and specialized knowledge that is entirely foreign to the main business of the mill. The power plant, however, is a very serious factor in the profit-earning capacity of the mill, for if every loom and spinning frame is not driven continuously at its maximum economic speed the productive capacity must fall off; there may be a loss of one to five per cent in capacity from this cause; also the cost of power may be excessive.

The power plant has gradually increased in complexity until it has become a distinct branch of engineering beyond the scope of the mill architect proper. Very few mills are developing their power at as low a cost as they should, although they may contain the most economical types of engines and boilers, because these have not been assembled into the most efficient working unit. The power plant has not been sufficiently considered as a working whole, attention having been confined too much to the individual units comprising it. The modern power plant engineer is the product of the electric power industry, where the economical production of power is the life blood of the business, and the shortage of experts in this line may be judged by the number of central stations whose power plants are anything but models, although this matter is of vital importance to them. The introduction of the electric drive now permits the development of the mill and the power plant along the lines suited to each without having the limitations of the one interfere with the other.

The operating management of the mill has to supervise all the processes of manufacture, and on the efficiency of this depends the success of the mill. There is thus on the same management the complex and unrelated business of running a power plant, the result of which can seriously affect the profits of the mill. The management can not give this last sufficient attention without danger of entailing much greater losses in the mill through loss of production. A decrease of mill efficiency of one per cent would offset a power plant economy of twenty per cent. The power plant problem must be met without loading any more burdens on the shoulders of the mill management. Manufacturers specialize in most things except in the production of power. Until recently they had to go into the power business whether they would or not; it will be to the profit of those manufacturers who evolve a proper method of divorcing the power business from the textile industry.

In some cases the problem can be best met by purchasing power, but the central station managers are very much at fault in this matter, as they are rarely willing to make equitable rates. They are running a lighting business first and a power business second. In a few years we will find power the main business and light a by-product. Where power can not be purchased I suggest the formation of what would be practically a separate power plant company from which the mill would take its power and steam exactly as it would from a central station. The larger mills could carry this out independently while the smaller ones could have such an organization in common, the fact that they were competitors being no more bar to this than it would be to their taking power from the same water power company.

In considering the replacement of an existing plant by a more economical one, the economies should be sufficient to pay all fixed charges on the new investment and a satisfactory profit besides, or the change will not be justified.

In considering the change of an existing mill from belt to electric drive it will be found that the saving in power will rarely justify the change, but if the opportunity be taken to completely remodel the power plant the results will frequently justify the investment. Also the possible increase in mill output, due to bringing all machines up to maximum speed, will very often justify the change independently of any power plant economies. In making improvements in a mill it is important that they form part of a comprehensive scheme and not be made in a disconnected manner.

My firm made a test of a large mill of which a small portion was electric driven and the rest belt driven. We found losses of $26,000 that could have been avoided:

Loss due to excessive price paid for coal	$14,000
Loss due to excessive air used in combustion	2,573
Loss due leaky dampers on economizers	1,595
Loss due use of smoke consumers	1,710
Loss due leak in feed-water heater	1,110
Loss due steam wasted by turbine	5,500
Total	$26,488

Aside from the price paid for coal this plant was being run up to the average of good mill practice and in some respects better. The losses found might have existed in the most modern plant if not detected by a most rigid system of records.

The unit costs of operation for the three power plants of this mill, figured on the basis of perfect operation, are:

COMPARATIVE UNIT COSTS OF OPERATION.
(Pocahontas coal, at $4 per ton)

COST OF COAL, AS BURNED, INCLUDING ALL LABOR.

A plant	$4.50 per ton
B plant	4.72 "
C plant	4.55 "

COST PER 1,000 POUNDS OF STEAM GENERATED.

A plant	20.00 cents
B plant	22.60 "
C plant	22.20 "

COST PER 1,000 POUNDS OF STEAM AVAILABLE FOR POWER, MANUFACTURING AND HEATING.

A plant	25.9 cents
B plant	25.2 "
C plant	25.35 "

COST PER 1,000 INDICATED HORSE-POWER HOURS FOR POWER.

A plant	$2.30
B plant	4.40
C plant	4.27

The differences in costs are, therefore, due entirely to the design of the plants and are a true measure of their relative value. It is interesting to note that the plant that generates steam at the least cost is not the one that supplies it to the mill at the lowest cost.

Steam distribution per week, present plant, is:—

	Pounds.	Per Cent.
Auxiliaries, stokers, etc	1,733,500	14.7
Engines	4,775,100	40.4
Manufacturing purposes	4,426,000	37.5
Heating (mean) for year	875,000	7.4
Total	11,819,600	

Exhaust from one engine used for heating water, part of which is used for manufacturing purposes.

POWER DISTRIBUTION PER WEEK.

No. Hours Run.	Kilowatts per Hour.	Kilowatts per Week.
6	2,430	14,550
55	2,200	110,000
6	200	1,200
67.5	344	22,400
Total kilowatt-hours per week		147,950

NOTE.—The output of the A and B engines has been reduced to equivalent kilowatts.

ANNUAL OPERATING EXPENSE, PRESENT PLANT.

Coal, 27,200 tons, at $4 per ton	$108,800
Labor, power plants	21,723
Labor, filter plants and arc machines	1,130
Removing ashes	953
Total	$132,506

On account of the subdivision of the power plants and the large quantities of live steam used in this mill we found that a new plant could be designed that would show sufficient economies to justify scrapping the present one. The new plant recommended consists of three Curtis vertical turbo-generators of 750 kilowatts capacity each, with special provisions for extracting steam at forty-five pounds for centring and carbonizing, and at five pounds for dye kettles, scouring, heating, etc.; the boilers to be three 1,000-horse-

[1] Paper read before the National Association of Cotton Manufacturers, Saratoga Springs, N. Y., September 29-30. Abridged.

power water-tube boilers, hand-fired with combined forced and induced draft, so as to give the greatest adaptability to various grades of coal.

The size of the unit adopted for turbines and boilers is as large as possible consistent with having the units of such size that if one breaks down the remainder can carry the extra load on overload capacity. The size of unit must also be selected with reference to the load at various times, so that those in operation shall carry as nearly as possible full load, in order to secure maximum economy.

Those more used to belt-driven mills where large engines are correct practice, because provision can not be made for breakdowns, or the load concentrated on one unit, have contended that two 1,500-kilowatt units would be more economical in this case. Not only would these entail a larger investment, but they would be actually more expensive to operate than the smaller units, owing to their poorer load-factor.

As for the effect of substituting steam at five pounds pressure for live steam in the dye kettles, etc., it should be borne in mind that after having done work in the turbine down to this pressure, it still has about 90 per cent of its original heat left, although it has given up nearly 50 per cent of its available energy. To keep up the capacity of the dye kettles, therefore requires only ten per cent greater weight of exhaust steam than of live steam, and large enough pipes to take care of the greater volume at this low pressure.

The new plant consisting of three boilers and three turbines and auxiliary apparatus, will do the work now done by three power plants containing 23 boilers, 4 engines, 1 turbine and the auxiliary apparatus in triplicate. It will require 15 men for its operation as against 33 with the present plant.

STEAM AND POWER DEMANDS, NEW PLANT.

Hours per Week.	Kilowatts per Hour.	Pounds Steam at 45 Pounds.	Pounds Steam at 5 Pounds.	Steam Turbines	Fed to Boiler.	Total Pounds per Week.
6	2,430	9,000	61,500	102,800	108,200	649,000
55	2,200	9,000	61,500	98,200	103,400	5,570,000
6	200	9,000	61,500	80,250	84,400	506,500
15	344	.....	29,000	34,200	36,000	539,000
52.5	344	.....	9,000	14,600	15,400	807,000
33.5	....	.....	9,000	.....	10,520	342,000
Total						8,413,500

UNIT COSTS OF NEW PLANT, WITH SOFT COAL, AT $4 PER TON, HAND-FIRED.

Cost per ton of coal burned	$4.42
Cost per 1,000 pounds generated	19.7 cents
Cost per 1,000 pounds steam available to mill.	20.8 "
Cost per 1,000 indicated horse-power	$1.98

ANNUAL COST OF NEW PLANT, USING SOFT COAL, HAND-FIRED, AT $4 PER TON.

18,740 tons of coal	$75,000
Labor	10,250
Removing ashes	610
Total	$85,860

Using the same grade of coal in each case the present plant costs $132,000 per year to operate while the new one will cost only $85,000 a year, or a saving in operating expenses of some $47,000.

A mill load is practically uniform, which is very favorable to economical operation and should permit power to be generated at a lower cost than a central station of the same size, except where the station has built up a heavy day load. But how many mills are able to show any such results? In order to reach high economy a proper system of records is necessary; those kept by most plants are useless. The power plant records to be of value must completely account for everything, practically continuous test data; what is more they must be promptly worked up and acted upon. If they are simply filed for future reference they are a useless expense and had better be omitted.

A separate power plant organization, such as I have advocated, should maintain an experimental station at the most convenient mill, a school of instruction should also be maintained for firemen and engineers. All men should be promoted according to their records, which should always be open to their inspection. Mr. Jurgensen, chief engineer of the Hotel St. Regis, has very successfully organized and conducted such a school for several years, resulting in a higher grade of men and a decrease in operating expenses. Very few mills are aware of what they might save as they do not know the extent of the losses.

My conclusions are that in textile mill power plants we should give more attention to the need of a higher grade of engineering skill and a more careful study of the local conditions in the design of the power plant.

Careful attention to the fact that what is wanted is the power plant that will deliver steam and power to the mill at the least cost and that it is not always the plant showing the highest evaporation or the lowest steam consumption that does this.

The selection of a size of unit, where other conditions do not outweigh it, that will permit one to be thrown out of service and allow the extra load to be carried on the overload capacity of the remaining apparatus.

Not to make improvements to existing mills until a comprehensive plan has been worked out, and then to make all changes in accordance with this.

The advisability of divorcing, where practicable, the power business from the textile industry.

The need of a system of power-plant records that will detect all defects and falling off in efficiency of machinery or men, coupled with a management that will at once remedy them.

Lake Superior Power Company Reorganization.

Announcement is made by the Lake Superior Power Company first mortgage bondholders' committee, which recently advised bondholders to deposit, that considerably more than a majority of the bonds have been deposited, and that an additional number has been pledged. The bonds continue to be freely deposited, many who were awaiting the deposit of a majority now lending their aid to the plan of reorganization.

The committee controls the situation and is said to be engaged in the preparation of a plan of reorganization which will give substantial value to the bonds deposited. The time for deposit has been limited to November 30, 1908. The Commercial Trust Company of Philadelphia and the Guaranty Trust Company of New York are depositaries.

Electrical Engineer and Draftsman for Federal Service.

The United States Civil Service Commission announces an examination on November 23, 24 and 25 to secure eligibles from which to make certification to fill a vacancy in the position of electrical engineer and draftsman in the office of the supervising architect, Treasury Department, Washington, D. C., at $1,200 per annum, and vacancies requiring similar qualifications as they may occur. Applicants should apply at once to the United States Civil Service Commission, Washington, D. C., for application form 1312.

Civil Service Examination for New York State and County Service.

The New York State Civil Service Commission will hold an examination on November 21 to secure eligibles from which to make certification to fill a vacancy in the position of engineering draftsman, Public Service Commission, First District, at a salary ranging from $1,200 to $1,800 per annum. The last day for filing applications for this examination is November 14. Full information and application form can be secured from Charles S. Fowler, chief examiner, Albany, N. Y.

FINANCIAL REPORTS OF ELECTRICAL COMPANIES.

PORTLAND ELECTRIC COMPANY.

The Portland (Me.) Electric Company's income account for the year ended August 31, 1908, is as follows: Gross, $304,951; expenses, $124,871; net, $180,080; charges, $106,277; surplus, $73,803, which compares with a surplus of $44,191 for the preceding year.

CUMBERLAND TELEPHONE AND TELEGRAPH COMPANY.

The report of the Cumberland Telephone and Telegraph Company for the month of September and nine months ended September 30 is as follows: September gross, $508,130; expenses, $288,719; September net, $219,411; charges and taxes, $43,766; September surplus, $175,645, which compares with $157,042 for September, 1907. Nine months' gross, $4,554,713; expenses, $2,642,036; nine months' net, $1,912,667; charges and taxes, $341,847; nine months' surplus, $1,570,830, as against $1,295,813 for the previous fiscal year.

EDISON ELECTRIC ILLUMINATING COMPANY OF BOSTON.

The twenty-third annual report of the Edison Electric Illuminating Company of Boston, for the year ended June 30, 1908, shows as follows: Gross, $4,229,239; expenses, $2,261,344; net, $1,967,895; miscellaneous profits, $38,441; total net, $2,006,336; taxes, $397,584; balance, $1,608,751; interest, $54,988; dividends, $1,390,796; surplus, $162,967, as compared with $85,602 for the year 1907.

President Charles L. Edgar says: "The increase in connected load during the past year has been as great as during the preceding year, which was, up to that time, by far the largest in the history of the company. Taking into consideration the business depression, which has existed during the greater part of the year, this result is extremely satisfactory.

"As will be remembered, the price was reduced in June, 1906, from eighteen cents to fifteen cents, resulting in a very large increase in business. A further reduction from fifteen cents to twelve cents went into effect on July 1, 1908. It is confidently expected that this reduction will result in still larger business."

There are now connected to the system 938,670 incandescent lamps, 9,867 arc lamps and 39,422 horse-power in motors. The corresponding figures for 1907 are 863,313, 10,339 and 35,095.

At the annual meeting of the company directors were re-elected, with the exception that C. F. Adams, 2d, succeeded Robert Bacon, recently resigned.

MONTREAL STREET RAILWAY COMPANY.

The preliminary report of the Montreal Street Railway Company for the fiscal year ended September 30 last, shows gross earnings of $3,677,432, an increase of $173,789, and total income of $1,591,049, an increase of $136,958. There was a surplus, after charges and dividends, of $235,687, a decrease of $36,571. The sum of $200,000 was set aside for appropriations, leaving $35,687, a decrease of $40,454.

AMERICAN LIGHT AND TRACTION COMPANY.

The American Light and Traction Company reports net earnings for the twelve months ended September 30 of $2,579,266, an increase of $189,368, and surplus of $597,208, an increase of $114,620. Following are the figures, with comparisons:

Net earnings, $2,579,266, an increase of $189,368; dividends, $1,301,058, an increase of $75,048; balance, $1,278,208, an increase of $114,320; reconstruction reserve, $681,000, a decrease of $300; surplus, $597,208, an increase of $114,620; previous surplus, $2,720,820, an increase of $482,588; total surplus, $3,318,028, an increase of $597,208.

MASSACHUSETTS ELECTRIC.

The operating companies of the Massachusetts Electric have declared the same dividends as a year ago, which means a declaration of four per cent on Old Colony and five per cent on Boston & Northern Street Railway stocks. These dividend payments will put into the treasury of the parent company a total of $880,837, and after allowing for miscellaneous income and deducting $157,500 interest on the $3,500,000 notes, should enable the Massachusetts Electric to show a dividend balance of better than $750,000, or, say, 3.6 per cent.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY.

The American Telephone and Telegraph Company has issued a financial statement for the nine months ended September 30, showing a surplus after dividends of $4,423,311, an increase of $1,169,220. The detailed income account for the period named is as follows:

Dividends, $10,034,016; interest and other revenue, $7,297,154; telephone traffic (net), $2,981,607; real estate, $120,134; other sources, $566,415; total earnings, $20,999,329; expenses, $1,571,755; net, $19,714,573; interest, $3,714,637; balance, $13,712,935; dividends, $9,289,024; surplus, $4,423,311, an increase of $1,169,220 over the previous year.

AURORA, ELGIN & CHICAGO.

The Aurora, Elgin & Chicago Railway's report for the year ended June 30, 1908, shows earnings as follows: Gross, $1,401,107, an increase of $69,122; expenses, $766,977, an increase of $44,697; net, $634,130; increase, $24,425; charges, $334,408; increase, $15,308; surplus, $299,722; increase, $9,117; preferred dividend, $155,000; balance, $144,727; common dividend, $93,000, leaving a net balance of $51,727.

MEXICAN TELEGRAPH.

The report of the Mexican Telephone and Telegraph Company for the month of August and six months ended August 31, shows as follows: August gross, $32,492; expenses, $17,881; August net, $14,611; six months gross, $196,925; expenses, $107,991, an increase of $7,787.

UNITED RAILWAYS OF ST. LOUIS.

The report of the United Railways of St. Louis for the month of September and nine months ended September 30, 1908, compares as follows: September gross, $887,344; decrease, $43,262; expenses, $554,164; decrease, $34,719; September net, $333,180; decrease, $8,543; charges, $234,380; increase, $1,976; September surplus, $98,800; decrease, $10,519. Nine months' gross, $7,860,624; decrease, $255,712; expenses, $5,073,080; decrease, $125,946; nine months' net, $2,787,544; decrease, $129,766; charges, $2,087,330; decrease, $96,399; nine months' surplus, $700,214; decrease, $33,367.

WESTERN UNION TELEGRAPH COMPANY.

The annual report of President Robert C. Clowry, of the Western Union Telegraph Company, for the year ended June 30, 1908, made to the stockholders at the annual meeting on October 14, shows that the capital outstanding is $99,817,100, of which $30,131.51 belongs to and is in the treasury. The revenues for the year were $28,582,212.09, a decrease of $4,274,194.16, and the expenses for the year were $25,179,215.33. The net revenue was $3,402,996.76, a decrease of $2,921,213.29. The profits were $1,670,746.70, a decrease of $3,233,402.29. The statement of expenses for the year showed operating and general expenses, including taxes, of $19,069,813.70; rental of leased lines, $1,546,-

181.87; maintenance and reconstruction of lines, $139,357.92; equipment of offices and wires, $423,861.84.

The net growth of the plant in poles and cables was 2,831 miles; in wire, 38,231 miles. There was a decrease in offices of 907, due principally to the fact that railroad companies have closed many small telegraph offices in consequence of the enactment of laws shortening the hours of labor. At most of these places messages are accepted and telephoned to an office of the company to be forwarded to their destination. Of the total of 1,359,430 miles of wire at the close of the year, 485,801 miles were of copper, and 873,629 of iron. The number of messages decreased 12,433,264, due to the depression in business and to the strike of operators, which began early in August of last year and continued until November 7. The average tolls per message transmitted by the company were the same as the previous year, but the cost so increased due to the strike that that branch of the business showed a small loss for the year. This loss ceased as soon as conditions became normal. Notwithstanding the abnormal expenses during the strike, the expenses for the year were reduced $1,352,980.87.

For the past few years liberal appropriations have been made for the maintenance of the company's line, and the plant is therefore in good condition.

The automatic printing telegraph owned by the company, and mentioned in the last report as having been put in operation at many of the principal cities, has been further extended to Washington, Cleveland, Cincinnati, Kansas City, Omaha, Denver and Nashville.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY.

The report of all associated Bell Telephone operating companies, not including long-distance lines, of the American Telephone and Telegraph Company for August and eight months ended August 31, is as follows:

August telephone revenue, $9,950,400; operating and maintenance expenses, $7,292,500; net, $2,657,900; sundry earnings (net), $452,900; total net earnings, $3,110,800; interest, $614,500; available for dividends, $2,496,300, which compares with $2,270,300 for August, 1907. Eight months' telephone revenue, $78,792,100; operating and maintenance expenses, $57,892,300; net, $20,899,800; sundry earnings (net), $3,415,900; total net, $24,315,700; interest, $5,144,300; available for dividends, $19,171,400, comparing with $17,477,700 for the corresponding months of last year.

KINGS COUNTY ELECTRIC LIGHT AND POWER.

The Kings County Electric Light and Power Company, including the Edison Electric Illuminating Company of Brooklyn, reports combined earnings for the quarter and nine months ended September 30, compared as follows:

July 1 to September 30:	1908	1907
Gross	$808,659	$843,376
Operating expenses	431,319	446,895
Net	$467,440	$396,481
Replacement and depreciation	108,340	63,198
Balance	$359,100	$333,283
Charges	151,640	151,640
Surplus for dividends	$207,460	$181,643
Quarterly dividend	200,000	200,000
Surplus for quarter	$7,460	$18,357
January 1 to September 30:		
Gross	$2,675,382	$2 516,211
Operating expenses	1,855,879	1,292,972
Net	$1,419,503	$1,223,239
Replacement and depreciation	303,338	177,711
Balance	$1,116,165	$1,045,528
Charges	454,920	454,920
Surplus for dividends	$661,245	$590,608
Dividends paid	600,000	564,000
Surplus	$61,245	$26,608

The following statement was issued with the earnings:

"The earnings of the Kings County Electric Light and Power Company for the quarter ended September 30, as also for the nine months of the year to date, maintained an increase in gross business of six and one-half per cent in comparison with the previous year, when times were exceedingly prosperous; the company has effected radical economics, the operating expenses being three and one-half per cent less than the previous year, making a gain of eight per cent in net earnings over operating expenses.

"The depreciation charges have been increased by more than seventy per cent, but this does not represent money spent, but only earnings set aside as a reserve against which replacements are charged as they take the place of depreciated or abandoned property. The Kings County company makes a large depreciation charge each month as a regular expense, and the credit to this fund after deducting all actual expenditures is now in excess of $500,000. Notwithstanding this very large increase in depreciation charges, however, the earnings of the company after deducting fixed charges for bond interest show an increase of more than fourteen per cent over last year, and after deducting the dividend for the quarter still show a surplus of $7,460 as compared with a deficit of $18,357 for the same quarter of 1907.

"For the nine months of the year to date the report shows increased earnings of twelve per cent after deducting all charges, including bond interest, and a surplus over and beyond dividends of $61,245, as compared with $26,608 for the preceding year.

"The September quarter shows a gain in percentages over the average for the three quarters, which indicates clearly that business conditions are improving, and that the report for the full year will be even better than that for the nine months just ended."

The Increasing Application of Electricity to Agricultural Operations.

This subject is exhaustively treated in a series of articles appearing in the *Elektrotechnische Zeitschrift*. As in other countries, there is a growing scarcity of labor also in the farming districts of Germany on account of emigration to the cities. One result of this has been the development of machinery suitable to replace human labor and increase the productivity of agricultural operations. Thus the number of steam plows in use in Germany has increased from 836 in 1882 to about 3,000 in 1905; threshing machines from 75,000 to 300,000, while the number of farm laborers has diminished from 9,700,000 to 7,000,000 during the same period. The cost of maintaining the draft animals during the idle times, which is estimated to be about 290 million marks a year in Germany, has been another factor in causing an increasing use of machinery. America and England were first to introduce practical agricultural machinery, but Germany is at present not behind in this field. There are many electrically-driven machines now in use, as seed-grain cleaners, weeders, plows, mowers, automatic reapers and binders, potato harvesters, beet pullers, threshing machines, irrigating plants, etc. These are all machines intended to increase the raw product, but there is also a large field for machines that will diminish the cost of agricultural operations, as lifting, unloading and transporting arrangements in barns and fields, and considerable work has already been done in this direction. In the dairies electrically-driven machinery is also extensively employed. The articles contain many tables showing the comparative costs of identical operations by hand and by electrically-driven machinery, with the results invariably in favor of the latter, also numerous illustrations, among them one of an eighty-horsepower four-share plow in operation, the current being supplied from a nearby trolley line.

Electric Furnaces in Germany.

In transmitting the following report on electric furnaces in German steel works, Consul Thomas H. Norton, of Chemnitz, says that apparently it is only a question of time until the crucible processes will be entirely superseded:

"Hitherto electric furnaces in Germany have been used chiefly for the treatment of small quantities, but now the leading works are beginning to employ them on an extensive scale for handling large quantities of metal. At the close of 1907 one of the most important steel works in the empire engaged in the production of cast steel for gears, as well as of the softer varieties of malleable cast steel for automobile construction and for minor machine parts, decided to replace its battery of crucible furnaces by a large electric fusion furnace. The main cause for the change was the desire to materially lessen the cost of fusion while not lowering the quality of the steel, but, on the contrary, improving it, if possible.

"The old equipment consisted of thirty-two furnaces, each containing six crucibles with a capacity of seventy-seven pounds. They are replaced by a single electric furnace of 250 horse-power, capable of holding a charge of a metric ton (2,205 pounds). A duplicate furnace is likewise installed and kept as a reserve for emergencies.

"Electricity is supplied from the large works of a company near Cologne, which furnishes a three-phase current of 5,200 volts to quite a large territory near the Rhine for both power and illumination. Alterations in the current intensity are so slight that connection is made directly, without the interposition of a regulator, between the furnace and the transforming station. At the latter, a three-phase rotatory current, reduced to a tension of 110 volts, is supplied.

"The production of cast steel in this furnace has been carried on since the beginning of 1908 without interruption, and with such a degree of success that the results are well worthy the attention of American steel manufacturers. Details of the cost and process generally are herewith reproduced in some fulness, on account of the far-reaching importance of this revolution in the central feature of one of the leading industries of the United States.

"The main product of the furnace has been cast steel, containing about .06 per cent phosphorus, .03 per cent sulphur, and from .08 to .18 per cent carbon. Occasionally charges of tool steel have been cast, containing from .7 to 1.3 per cent of carbon, with and without the addition of nickel, chromium, or tungsten. The material employed is ordinarily slugs, cuttings, turnings, and other waste of wrought iron, costing from $14.28 to $15.47 per metric ton (2,205 pounds); $12.96 to $14.04 per short ton. A fusion, including the refining, lasts about five hours and involves a consumption of about 900 kilowatt-hours for one metric ton of cast steel. The entire charge of one ton is poured at once. When the furnace is kept in continual use the magnesite lining lasts for about seventy operations, *i. e.*, twenty to twenty-five days. A stoppage of five days is required for each renewal, but during this period the reserve furnace is employed.

"The cost of the electric current is exceedingly low, on account of the large amounts consumed. It amounts to four and one-half pfennigs (1.071 cents) per kilowatt-hour, so that the expense for a single operation is about forty marks, or $8.64 per short ton.

"The total cost of cast steel, thus produced, per metric ton, is as follows:

For	Cost.
Amortization of cost of plant	$1.19
Raw materials, including additions, chromium, etc	16.66
Electric current, including heating during intervals	10.71
Renewal of magnesite lining	2.85
Labor	2.38
Electrodes	.60
Water for cooling purposes	.12
Total	$34.51

"This amounts to $31.32 per short ton, and is materially less than the cost of crucible steel.

"The manufacturing firm notes in addition these advantages in the electric process, as compared with the old method: (1) Cheaper raw material can be employed in the place of the more expensive Swedish iron formerly required; (2) in fusing quantities of a ton at a time it is possible to produce homogeneous masses of a distinct, well-defined grade; (3) the molten steel leaves the furnace at a much higher temperature than when prepared in crucibles, is therefore in a more liquid condition, and is easily transferred to ordinary ladles, preparatory to pouring into the molds of small castings.

"These electric furnaces are arranged on the Stassano system, and are supplied in all sizes for charges varying from 400 pounds to ten tons, and are adapted for the fusion of metals of every kind. The construction is shown by the designs forwarded (and filed for inspection at the Bureau of Manufactures).

"The furnace for cast steel is constructed of iron plates, heavily lined with magnesite bricks. Carbon electrodes enter by three openings on the sides, and are so adjusted as to terminate slightly above the surface of the molten metal, whereby the heat of the arc is absorbed almost entirely by the contents of the furnace, and but a small portion is radiated upward, to be reflected from the concave dome.

"A thorough mixing of the component parts of a charge is effected by mounting the furnace on an axis, slightly inclined from the vertical. A steady revolution about this axis is maintained through a cogged connection, with a dynamo of five horse-power, the edge of the furnace resting on ball bearings. This rotation causes the lower layers to gradually rise to the top of the molten mass, and brings about a thoroughly uniform mixing. The electrode supports are inclosed in cylinders and surrounded by a current of cold water. These supports are in rigid connection with hydraulic cylinders, by means of which the movements of the electrodes are under perfect control.

"A fusion requires three and one-half hours to be complete; a further period of one and one-half hours is requisite for the removal in succession of phosphorus and sulphur, and the final deoxidation of the contents of the furnace. No interruption occurs in either the current of electricity, or in the supply of water for cooling the electrode supports, while the furnace is in rotation. Special devices have been provided for both purposes.

"The services of three workmen are required to conduct an electrical furnace, change electrodes, transport the raw materials, etc. Furnaces of the type in question are now being introduced in Germany for the treatment of other metals and alloys, and it is apparently only a question of time before the crucible processes hitherto in such general use will be completely superseded."

The Chicago Electric Club.

The Speakers' Committee of the Electric Club, of Chicago, Ill., announces the following programme for November: November 4, business meeting; November 11, address by William Carroll, city electrician, on "Street Lighting—Past Present and Future"; November 18, address by Thomas I. Stacey, treasurer of the Electric Appliance Company, on "Chicago, the Great Central Market"; November 25, Frederic P. Vose, attorney for the Electrical Trades Association, on "Contracts."

Expense of Conducting New York State Public Service Commissions.

According to a statement prepared by Secretary Travis H. Whitney and made public recently at the office of the Commission of the First District, the two Public Service Commissions are not costing the taxpayers of the State and city so very much more than did the commissions which they succeeded. The statement of the expenses of the commission is prefaced with the following:

"So much criticism has been made of the expense imposed upon the State and upon the city of New York by the two Public Service Commissions that it is important to make a comparative statement as to such expenses."

The statement contains the following comparative tables:

"The expenses of the Rapid Transit Commission (to which the Public Service Commission for the First District succeeded), estimated on its expenditures for its last six months (which ended in the middle of its fiscal year), were $921,-459.10.

"The expenses of the Railroad Commission, estimated on its expenditures for its last nine months (which ended before the end of the fiscal year), were $101,-578.20.

"The expenses of the Gas and Electric Commission, estimated on its expenditures for the last nine months (which ended before the end of its fiscal year), were $60,171.80.

"The expenses of the state inspector of gas meters, estimated on his expenditures for the last nine months (which ended before the end of his fiscal year), were $23,440.67.

"Thus the total annual expenses of the various commissions to which the present Public Service Commissions succeeded were $1,106,649.77."

Compared with these annual expenses are the following expenses of the two Public Service Commissions for the year ended June 30, 1907:

"The expenses of the Public Service Commission for the First District upon rapid transit matters under the Rapid Transit act requiring an engineering force of about 300 employés, $600,000.

"The expenses of the Public Service Commission for the First District to carry out its duties under the Public Service Commissions law and the Railroad law, $366,861.32.

"The total expenses of the Public Service Commission for the Second District under the Public Service Commissions law and the Railroad law, $234,282.09.

"Total expenses of the two Public Service Commissions under the Public Service Commissions law, the Railroad law and the Rapid Transit act, $1,201,143.41.

"It will thus be seen that the net increase in the expenses to the State and city for the two Public Service Commissions over the annual expenses of the officers whom they succeeded was only $94,-493.64."

In conclusion Mr. Whitney writes:

"This increase is less than the average annual increase of the expenses of the commissions which were abolished, and shows that the two commissions have done not merely the work of the preceding commissions but also all of the work involved in the duties imposed by the Public Service Commissions law which had not heretofore been exercised by any state body.

"It is to be noted that the Public Service Commission for the First District did the rapid transit work under the provisions of the Rapid Transit act at an expense which is $321,459.10 less than the expense of the Rapid Transit Commission for its last year, although the number of employés on rapid transit work was greater than that under the Rapid Transit Commission.

"Omitting the expenses of the rapid transit work done by the Public Service Commission for the First District, it will be seen that the total expenses for the efficient regulation of public service corporations afforded by the Public Service Commissions law are $601,143.41."

The Rental Value of a Power Plant.

"The rental value of a power plant depends upon its character and efficiency to produce power cheaply.

"The cost of producing power in small amounts is very much greater than in large amounts, and the amount which the lessee should pay may be obtained in comparison with the cost of producing the amount of power required with a reasonably efficient plant with steam power or by some other means. Thus, supposing the power to be rented is water power and plant, its value can be determined by estimating the cost of producing a uniform power by water power, supplemented by steam power if necessary, and comparing the cost of producing the same amount of power by steam power alone, in each case adding such charges as the lessee is to assume. The difference, if in favor of the water power, will represent the value of the power for the length of time the estimated cost covered.

"If the power plant be a steam plant, it is possible that it has no rental value; that is, it may be so wasteful that it would pay to replace or change parts of it to bring it into an economical state. If it is an economical plant, and is to be run by the lessee, he should pay such rent as will cover depreciation and a fair rate of interest, and assume repairs, insurance and taxes, or pay enough rent to cover them.

"In the same way, if power is sold the lessee, the proper amount to pay per horse-power per year will vary with the amount which he requires.

"As the amounts of power grow smaller, the cost of producing it is larger, and therefore a larger price per horse-power per year must be paid.

"The charges for small amounts of power seem to vary from fifty dollars to one hundred dollars per horse-power per year; but each case should receive careful attention."—*From paper by Charles T. Main, mill engineer, Boston, Mass.*

New New York Transportation System.

Arrangements have been completed, it is announced, for the purchase from the Interborough Rapid Transit Company, of New York city, of the Pelham Park & City Island Railroad and the installation thereon of the American monorail system. At its meeting last week the Public Service Commission for the First District, New York, received the application for the change of motive power from horses to electricity and the installation of the monorail system, and referred it to a committee of the whole. It is anticipated that the system of transportation will be in operation three months after approval has been given by the utilities board.

A corporation known as the Monoroad Construction Company has been organized with a capital stock of $1,500,000, in which the Interborough company will have an interest, to construct and equip the road with the monorail system.

It will be remembered that this system is the one which was exhibited at the Jamestown Exposition last year.

At that time it was announced that a road between New York and Newark was to be built without delay. Legal obstacles were, however, encountered in places where the promoters of the project had every reason to believe there would be none, which have postponed that work.

Changes in the Electrical Inspection Service, New York City.

Commissioner John H. O'Brien, of the Department of Water Supply, Gas and Electricity, of New York city, has placed Charles F. Lacombe, chief engineer of light and power, in charge of the electrical bureaus of that department in all the boroughs, and at Mr. Lacombe's request has assigned Hubert S. Wynkoop, electrical engineer in charge of the Brooklyn bureau, as assistant engineer.

This action accomplishes a long-desired result, namely, the placing of the various bureaus of electrical inspection under one head in order to secure uniformity of routine and rulings throughout the entire city. Heretofore considerable confusion had been caused by the absence of a central authority to whom disputes, applications for approval of appliances and proposed changes in the rules might be referred.

The personal equation will be largely eliminated as to approval of appliances, materials, etc., by the formation of an advisory board, consisting at present of Mr. Lacombe, Mr. Wynkoop and Professor George F. Sever, of Columbia University, consulting electrical engineer to the department. The department has an agreement with the university to the end that the latter makes such tests of appliances as may be required. The well-equipped laboratories of the university will thus be available for the department, and all applications for approval which require tests will be referred to Professor Sever in the first instance, who will submit a report to the advisory board. The board will then submit a recommendation in the matter to the commissioner, whose approval makes the decision final. Frequent bulletins will be forwarded to the borough officers of the bureau, so that the engineers and chief inspectors of each borough will be advised simultaneously of the action taken.

With a realization that the department and the insurance inspectors are working along different lines of interest toward a common end, an arrangement is being made to effect closer relations with the underwriters and the lighting companies than have existed heretofore.

Considerable complaint has existed in the past over the difficulty experienced by contractors and material men—even by the department chief inspectors themselves—in securing general rulings on doubtful points or information in advance of changes in the rules or of approvals or disapprovals of appliances. It is hoped to overcome this criticism by using the electrical papers of the city to announce contemplated changes in the rules, so that interested parties may have an opportunity to present their arguments, and to give to the public from time to time substantially such information as will be issued to the borough officers of the bureau. Furthermore, except in the cases of grave danger, no changes will be put into effect "at once," and every effort will be made to avoid the unnecessary hardship to the electrical contractors that comes from too swift action.

The three officers of the bureau are all graduate engineers and experienced in the lines of work required of the Bureau of Electrical Inspection.

Improved Conditions in the Electrical Companies.

The gross business of three big electrical companies, says the *Wall Street Journal*, has shown an average improvement of close to forty-five per cent from the low point at which sales were running during the depth of the depression. The statement continues:

"At the present time the General Electric, Westinghouse Electric and Western Electric are doing a total gross business of about $94,000,000, as against $65,000,000 at the low point. This is an improvement in sales of $29,000,000, or forty-four per cent.

"The largest actual improvement has of course been shown by the General Electric, but in percentage of improvement the Westinghouse Electric outstrips either of the other two companies, a fact which very probably has considerable connection with the success of the reorganization plans.

"The present rate at which gross sales are running, the rate at the low point, the recovery and percentage of recovery for each of the three companies are shown in the following comparison:

	Present Rate.			
Company.	Gross.	Rate Low.	Recovery	Per Cent. Recovery.
General Electric.	$42,000,000	$30,000,000	$12,000,000	40
Westinghouse .	22,000,000	13,000,000	9,000,000	69
Western Electric	30,000,000	22,000,000	8,000,000	36
Total. ...	$94,000,000	$65,000,000	$29,000,000	44

"In a general way the effect of the 1907 panic upon the sales of electrical apparatus has been to force the demand back to the standard obtained in 1903 and 1904. In the case of Western Electric the presence of special conditions in the telephone field reduced gross sales to a level with those for the year 1901."

A Communication from Mr. George H. Guy.

To the Editor of the Electrical Review:

My attention has been called to the fact that my name has been unwarrantably used several times recently as "secretary of the New York Electrical Society," by way of giving apparently the endorsement of the society to the subject matter. The latest instance of this kind is the circulation of a postal by the Phillips Publishing Company, in which the attention of the members of the society is called to an article in a November magazine, in the words: "At the suggestion of Mr. Guy, secretary of the New York Electrical Society, I wish to call your attention to an inspiring article," etc.

I wish to say that this is not only impertinent, but absolutely unfounded. The society's year-book, with list of members, is freely given to those desiring information concerning the society. Application in this case was made for a copy, which was furnished, as usual, but without the slightest "suggestion" from me of any kind whatsoever. It is rather hard that such official courtesy should be abused.

I desire therefore to take this opportunity of saying that in no one instance where my name as secretary of the New York Electrical Society has been used in this manner has there been the slightest warrant for any consent or permission on my part, and I wish to say, if it need be said, that no one has a keener sense than myself of the impropriety that would be involved in such action by me.

Yours truly,

George H. Guy.

New York, October 26.

Approves Zone Basis of Fare Collection.

The up-State Public Service Commission, New York state, on October 14 in dismissing a complaint seeking reduction in fare from ten to five cents between Albany and Watervliet sets forth that there is no injustice in the practice of street railway lines in fixing their rates of fare on a zone basis instead of a mileage basis.

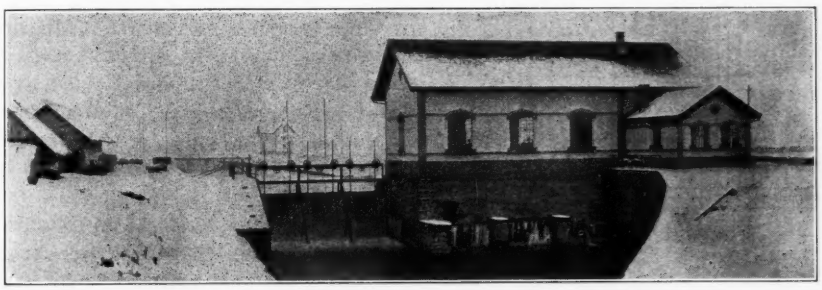
Illinois Central to Electrify Chicago Tracks.

Electrification of all tracks of the Illinois Central Railroad within the city of Chicago, Ill., was authorized at the annual meeting of stockholders on October 21. The stockholders also passed a resolution urging the directors to "proceed with all reasonable despatch in electrifying the service."

A Practical Application of Asynchronous Generators.

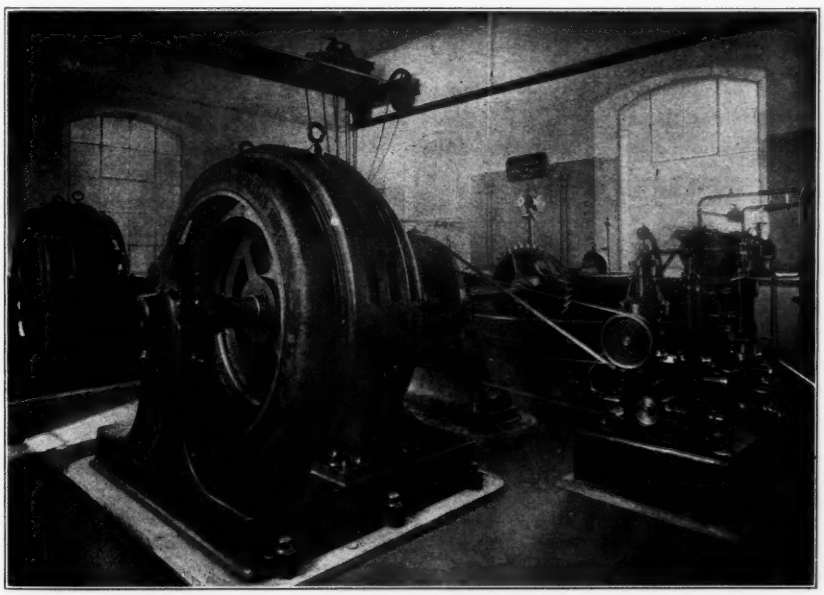
By Frank Koester.

AN interesting example of the parallel operation of two asynchronous generating stations with a single synchronous station is found at the Rhein Binnen canal, Switzerland, and the following brief description includes the essential features of this installation.



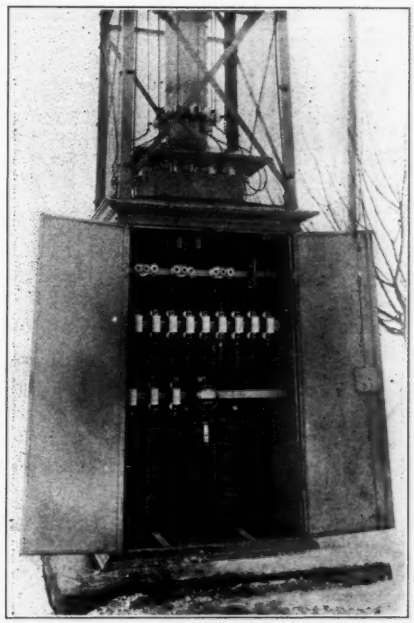
MAIN GENERATING STATION, MONTLINGEN.

In order to prevent the Rhein from overflowing its banks during flood season in the region near Lake Constance, the governments of Switzerland and Austria have taken steps to regulate the flow by means of canals. They built on the Austrian side, besides several small canals, the Vorarlberger Binnen canal, and on the Swiss side, the Rheintalischer Binnen canal. The latter canal, owing to the contour of the region, is constructed with three levels: One has a drop due to irregularity of water supply of from 9.8 to 11.5 feet; another from 17.5 to 21.2 feet, and the other from 31.8 to 35 feet. These heads are respectively utilized by three power plants. One is located at Lienz, another at Blatten three miles below, and the third at Montlingen, 2.4 miles below Blatten. For an economical reason the Oerlikon Company, of Oerlikon, Switzerland, which supplied the electrical equipment for all three stations, and the transmission system, proposed to make the station at Montlingen the main plant and those at Lienz and Blatten auxiliary plants, and equipped the former with synchronous, and the latter with asynchronous, generators, operating them in parallel.



INTERIOR OF SYNCHRONOUS GENERATING STATION.

The auxiliary stations with their asynchronous generator equipment do not require special excitation, as they are thrown on the line after the main station is in operation. Owing to the characteristics of an asynchronous generator, it is only necessary that they be near synchronism before being thrown on the line, thus doing away with synchronizing apparatus, delay in synchronizing, and skilled attendants. The whole regulation is done from the main plant. The disadvantage is that the auxiliary plants depend on the main plant for excitation, which also has to furnish the charging current for the line, thus forcing the synchronous generators to work under a low power factor, which is increased as more asynchronous generators are thrown on the line.



TYPE OF STREET TRANSFORMER STATION.

This disadvantage, however, is greatly reduced by the lowering of first cost and maintenance of the auxiliary plants.

The main plant at Montlingen is at present equipped with three 250-horsepower Francis turbines, mounted upon vertical shafts and bevel geared to synchronous, three-phase generators of 10,000 volts and fifty cycles, making 250 revolutions per minute. Each generator has its own exciter mounted on the overhanging shaft. The generator leads are bare, mounted on insulators and run in trenches to the switchboard.

The switchboard is divided into five panels, three for generators and two for outgoing lines. Each generator panel has a main and exciter ammeter, the lever for the generator oil switch, and a hand wheel to control the excitation. The hand wheels can be interconnected by a

shaft so that they can be operated simultaneously. The phasing of the synchronous generators is done with only one-phase lamp and a voltmeter, which are mounted on one of the feeder panels. Each of the lines is equipped with an automatic oil switch and an ammeter. One integrating wattmeter totals the entire output of the plant. The switchboard contains only low-tension apparatus; all the high-tension switch gear is located in reinforced concrete compartments in the switching room behind the switchboard.

In the room above this are the protecting devices, each phase having a choke-coil and series of horn lightning arresters, connected to water rheostats. To properly inspect the latter two, they are provided with disconnecting switches.

The outgoing feeders leave the switching house on the third floor. For lighting the station there is installed a 1.5-kilowatt single-phase transformer, and for operating the motors in the repair shop there is a six-kilowatt, three-phase transformer.

The two auxiliary stations are in every respect, in regard to equipment, identical. Each plant has a 250-horse-power Francis turbine, similar to those in the main station, also operating the generators by bevel gearing. The asynchronous generators are 10,000 volts, fifty-cycle, operating at 250 revolutions per minute. The equipment of the switchboard and switching room is similar to that of the main plant, with the elimination of the apparatus for excitation and synchronizing apparatus.

The receiving current from the two asynchronous stations and the distribution of power is controlled from the synchronous or main plant at Montlingen. From here run lines to Oberreit, Alstätten and Heerbrugg, the latter two being connected by a separate line, thus forming a ring system. At Alstätten there are three 100-kilowatt transformers, stepping down from 10,000 to 2,000 volts. In Heerbrugg there are two 100-kilowatt transformers stepping down from 10,000 to 230 volts. The 2,000-volt current is distributed to a number of smaller transformer stations which are either of masonry or steel, a type of the latter being shown in the accompanying illustration. The current is used chiefly for induction motors for manufacturing purposes, and as there is no separate lighting circuit, the current is distributed by the three-wire system.

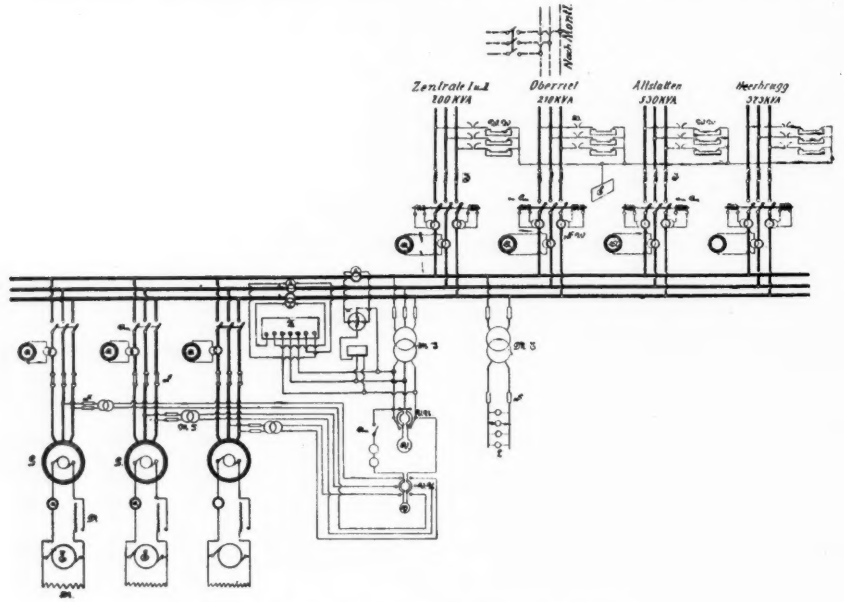
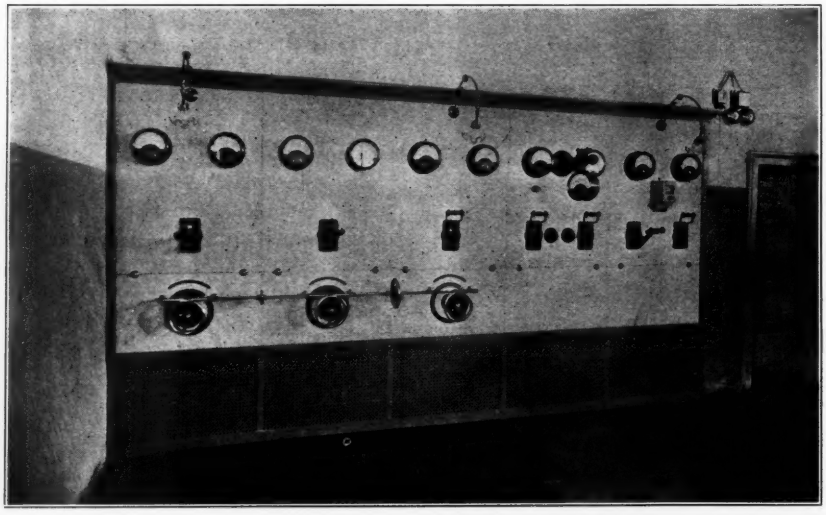


DIAGRAM OF CONNECTION, MONTLINGEN STATION.

G=Synchronous Generator.
E=Exciter.
A=Ammeter.
V=Voltmeter.
W=Wattmeter.
Z=Integrating Wattmeter.
Au=Switch.
Auau=Automatic Switch.
VU=Bus-Bar Voltmeter.
S=Fuse.
R=Rheostat.
SW=Potential Transformer.
MT=Series Transformer.
I=Choke Coil.
WW=Water Rheostats.



SWITCHBOARD OF SYNCHRONOUS GENERATING STATION.

Long Acre Electric Light and Power Company.

The Long Acre Electric Light and Power Company on October 24 got from Justice Bischoff, in Special Term of the Supreme Court, a writ of certiorari to review the action of the Public Service Commission for the First District, state of New York, denying its application for permission to issue $10,000,000 preferred stock with a specified dividend of seven per cent; to issue $50,000,000 worth of six per cent, fifty-year gold bonds, only $12,000,000 of which is to be issued at present, and for permission to install electric wires and an underground system.

The company also demanded a rehearing of the entire matter, and the court directed the Public Service Commission to file in the Supreme Court the record of the hearings before it.

The petition on which the writ was issued was signed by John C. Sheehan as vice-president of the Long Acre Electric Light and Power Company. He set forth that the original application of the company to the Public Service Commission was refused, and that on October 23, after a rehearing, the Public Service Commission again denied the application.

The American Street and Interurban Railway Engineering Association.

Report of the Wednesday Afternoon and Friday Morning Sessions of the Convention Held at Atlantic City, N. J., October 12 to 16.

WEDNESDAY AFTERNOON SESSION.

THE Wednesday afternoon session of the American Street and Interurban Railway Engineering Association was called to order at 2.30 o'clock, the first order of business for the afternoon being the report of the Committee on Control. The report of the previous sessions of this convention, which was held at Atlantic City, N. J., October 12 to 16, was given in last week's issue of the ELECTRICAL REVIEW.

E. W. Olds, chairman of the Committee on Control, explained that it had not been possible for the members of the committee to devote to the work of preparing the report the proper attention needed to give it the necessary completeness.

The report contained two contributed papers, one by F. E. Case, of Schenectady, N. Y., describing the Sprague-General Electric automatic control, and the other by William Cooper, of Pittsburg, Pa., describing the controlling apparatus manufactured by the Westinghouse Electric and Manufacturing Company.

The discussion of this report was opened by Paul Winsor, of the Boston Elevated Railway Company. He called attention to the commutation of the brushes which are now being placed on the market, and stated that the brushes and commutator will stand tremendous overfeeding. During the last year or so, in Boston, the company has changed the resistance steps on every equipment on the road in order to get an even control. Mr. Cooper in his paper considers an acceleration of five miles per hour possible. Mr. Winsor did not think this could possibly be the case. He said that in elevated service an acceleration of this nature would throw passengers from their seats. His company believes very strongly in automatic features of control. There has been trouble caused by the dash-pots sticking. In service he gets about a mile and a half acceleration on the level. With a heavily loaded car it is not as high as that. There is considerably less trouble with automatic equipments now than there was a few years ago. In his opinion, however, the platform controller, where it can be used, is preferable. Mr. Winsor described the relay system for indicating, which utilizes a buzzer or alarm bell to indicate to the motorman that he is starting up too fast.

In discussing this report, Mr. Doyle stated that in New York his company had made a number of observations on the operations of motormen, and had discovered that there was a difference of from thirty to thirty-five per cent in the amount of current used under similar conditions. He was of the opinion that if the manufacturers of controllers could devise something that would indicate the extent of coasting of trains and the correct acceleration, that a reduction in current consumption could be secured. His scheme for measuring current used was to employ an ordinary time clock, which, as soon as the motorman shut off his controller, would start. While the train was coasting the clock would run and measure up the amount of time spent by the train in coasting. Mr. Doyle believed it would be a good plan to have the Committee on Control or the Committee on Maintenance give this matter consideration, and after some discussion a motion to this effect was adopted.

Mr. Munger stated that after a car had been overhauled and was about ready to be placed in service, the shopmen take the car out on the track and an ammeter is placed in the motor circuit. This is a direct-current ammeter, reading up to 500 amperes. One man handles the car while the other watches the ammeter to see that every point is taken easily. If the car does not notch up satisfactorily it is taken back into the shop and the trouble is located and adjustments made in the resistance until the car accelerates perfectly. The man who reads the ammeter has a stop-watch, and he notes the length of time consumed in the acceleration, which is taken from starting up to the point where the motors go into full multiple with all resistance out. Mr. Munger thought sufficient attention was not given to the matter of coasting, and he said that it was necessary every once in a while to bring up a number of motormen who paid no attention whatever to coasting. If a device could be procured which would keep a record of the amount of coasting done, it would be a valuable adjunct to the service. The matter of multiple-unit control for city service, he said, should receive attention, but if automatic acceleration could be secured, it was better than anything a motorman could do, no matter how careful he was in notching up. While the automatic feature may be charged with failures once in a while, it compares more than favorably with the failures which are the result of the motorman's notching up his car too fast.

Mr. Case, of the General Electric Company, said that a careful analysis had been made of the sticking of the dash-pots, and it had been found that it was due in a great measure to the condensing of moisture in the dash-pots when the car was laid up. This moisture runs down between the plunger and the cylinder and causes sticking. As the clearance between the plunger and the cylinder is very small, it requires only a very little moisture to cause trouble. He believes that with new designs this difficulty has been entirely overcome, because, when the relay is at rest there is no space within the dash-pot, and consequently no moisture can be precipitated to cause sticking.

Mr. Cooper, taking up the statement made by Mr. Winsor with regard to acceleration and retardation, stated that five miles acceleration or retardation could be secured with perfect control. Recent breaking tests have been made, which demonstrate that a retardation of five miles an hour can be secured without any uncomfortable jolting.

In answer to a question concerning the use of the ammeter and stop-watch, Mr. Munger stated that the rate of acceleration is adjusted by the stop-watch, and the effort is made to adjust the resistance so that every tooth and peak is the same. The time for full acceleration is fixed at eleven seconds. Mr. Munger also stated that adjustments were made every 60,000 miles.

The report of the Committee on Power Distribution was presented by W. J. Harvie, chairman. This report included a paper entitled "Application of the Theory of the Catenary to Electric Railway Work," by R. L. Allen, Syracuse, N. Y.

The report is divided into a discussion of the following subjects: Feeders, working conductors, return system, conduit system. It seems to be the standard practice with low-tension underground feeders to use saturated paper-insulated, lead-encased cables, the paper being five-thirty-seconds inch in thickness, and the lead from one-eighth inch to five-thirty-seconds inch in thickness. One large company is using five-thirty-seconds inch rubber insulation with a triple-braid cover without lead sheath. This company seems to endorse this method without hesitation. It seems to be the general opinion that some kind of fireproof protection is needed on the outside of the lead cable sheath in manholes. Some roads are using asbestos saturated with a solution of silicate of soda. A split-tile protection is recommended by one of the large roads. The majority of reports received by the committee indicate the use of No. 00 round wire on city and interurban work for ordinary trolley conductors. A number of companies, however, are using No. 0000 wire on interurban

work and for renewals on city work. Regarding a standard height for trolley wire, the committee believes it good practice and recommends that height of trolley wire above top of rail be standardized at nineteen feet. The majority of roads reporting show the use of clinch ears on work now in service. Some roads, however, on which grooved trolley wire is used, are employing mechanical clips, but they find that when these mechanical clips are to be replaced it is usually necessary to substitute the clinch ear. It appears that electric railway companies are using all types of straight-line hangers and insulators, with the round-top bell-type predominating. It is the experience of electric railway companies that both wood and iron poles are subject to excessive deterioration at the ground line. Many companies have begun the practice of using so-called wood preservatives for wood poles, but up to the present time none of these has been able to show definite results. For iron poles the committee recommends without qualification the use of an iron sleeve shrunk on all iron poles at the ground line. This sleeve should be two feet in length, and so placed on the butt section as to have the middle point of the protecting sleeve at the ground line when the pole is set in place. The committee recommends that iron poles be purchased complete with this protecting sleeve. Of six roads reporting, three use the over-running type, and three the under-running type of third rail. Wood, reconstructed granite and composition insulators are used on the over-running type of rail. Wood, porcelain, semi-porcelain and composition insulators are used on the under-running type. The spacing of third-rail supports is generally ten feet, with a maximum in some instances of eleven feet, and a minimum of five feet. The weight of brackets varies between nine pounds with the over-running rail, and thirteen to twenty pounds for the under-running rail. The committee recommends a spacing of ten feet on all third-rail construction where thirty-foot conductor rail is used, and eleven feet where thirty-three-foot conductor rail is used. None of the companies reporting over-running third-rail construction uses protection throughout, while the under-running type is protected by wood or fibre. The majority of companies reporting show the use of No. 0000 grooved trolley wire for catenary work. The committee recommends this size and shape. All companies show the use of the mechanical clip, and there seems to be no doubt that this will continue to be modern practice. A rigid form of suspender is recommended by the committee. For messenger cable the committee recommends the use of the highest strength cable that can be obtained, in order to develop the full advantage of the catenary type of construction. The cable should be of unwiped wire. The subject of insulating supports for the messenger cable on high-tension service resolves itself into the use of porcelain entirely, the shape of insulators depending largely upon the voltage used. Strain insulators for heavy strains should also be made of porcelain. For steady strains and pull-offs the use of wood is permissible where moderate voltages are used, and a combination of wood and porcelain for higher voltages. A more recent development in supporting devices for catenary work indicates the use of structural steel bridges rather than poles.

In the paper contributed to the report by Mr. Allen, the following conclusions are presented: The use of a light plow steel messenger cable strung to a small sag. The hangers themselves should be as light and flexible as is consistent with strength and durability. The hangers should be spaced twenty or thirty feet to take care of the expansion or contraction. There is no reason why spans of 300 feet or more can not be used.

The discussion of this report was opened by a communication from R. D. Coombs, of the Pennsylvania Railroad. Mr. Coombs endorses generally the suggestions made by Mr. Allen, and states that no system can be successful which does not practically eliminate sparking and undue wear of the current collector. At present no definite decision can be made as to whether the single catenary construction or the secondary catenary construction is better suited for eastern climatic conditions and American operating requirements. The successful type must accommodate itself to changes in temperature and provide a trolley wire on which the collector may run smoothly. From an operating standpoint the construction should not involve unnecessary supports over the tracks, and long spans are therefore desirable. Mr. Coombs is of the opinion that spans in excess of 300 feet will be both economical and practicable.

Contributing to the discussion of this paper, Mr. Ayres stated that he had originally equipped his road with trolley wire and mechanical clips. A strong tension had to be applied at the base in order to keep the collector on the wire at high speeds. A heavy hammer blow was developed at the hanger, which caused cutting and kinking. It was found expedient to throw out the mechanical clip and use an appliance with copper ears. This gives better results and puts the wear on the lips of the ear, which can be replaced, rather than on the trolley wire, which is more expensive to replace.

Mr. Reed stated that in his opinion, if there was a breakdown in the insulation of a lead-protected cable, the trouble was accentuated by the metal covering.

Mr. Winsor stated that one of the reasons why his company had tried cables without the lead cover was due to the fact that if a bad short-circuit occurred on an underground cable, the trouble did not stop there. Other cables are affected, sometimes at the same time, or, more often, the trouble turns up a good deal later.

Mr. Corning stated that he had had much trouble due to the burning out of lead cables, and in order to guard against this the practice had been introduced of cutting the lead sheath in each manhole, taking a ring out of the sheath about a quarter of an inch wide, and filling the space with rubber tape, heating it, and making what might be called a rubber joint at each of these points. The sheath is made continuous again by a short copper wire around the joint to take care of the return current on the sheath.

Mr. Palmer stated that varnished-cambric cable was being used a good deal more extensively than many members of the association were aware. He knew of large orders which had been placed lately for a good deal of construction, and it was because of the trouble caused by electrolysis that a decision was made in favor of the cambric-covered cable.

Mr. Kelsay stated that his operating conditions were rather extreme from the standpoint of height of trolley wire. He has a limited service where a car operates on a wire from fourteen to twenty-two feet high. The state law requires the trolley wire to be twenty-two feet over railroads. There is another piece of road which is forty miles in length, where the trolley wire is very low, in some cases fourteen or fifteen feet. He has tried to maintain poles so that they will operate successfully over the range from fourteen to twenty-two feet. This is a condition which should not be imposed on any trolley.

Mr. Hayward stated that his road had been compelled to enter into agreements with railroads to maintain the trolley at twenty-two feet at the crossings. It seemed to him that this requirement introduced an element of danger. A pole that is built to ride on a trolley wire of the standard height of nineteen feet is more liable to come off the wire at twenty-two feet than at nineteen feet.

The session was then adjourned to meet Friday morning.

FRIDAY MORNING SESSION.

The first matter for consideration was the report of the Committee on Car and Car-House Wiring.

The committee reported that it had been unable to give proper consideration to the question of whether it was possible to construct standard specifications for car and car-house wiring. The rules of the National Electrical Code concerning the installation of heaters, the size of bonds, and the lighting of cars, were made a part of the report, and the rules which were adopted by the Electrical Committee of the Underwriters' National Electrical Association as a result of a conference with representatives of the committee and representatives of various heater manufacturing companies were given as follows:

"Truss plank heaters to be mounted on not less than one-quarter-inch fire-resisting material, the legs or supports for the heater providing an air space of not less than one-half inch between the back of the heater and the insulating material."

Concerning outlets, the following paragraph is provided:

"Each outlet to be provided with an approved porcelain receptacle or an ap-

proved cluster, no lamp consuming more than 128 watts to be used."

The code was also altered to include the following rule:

"All lighting and stationary motor circuits must be thoroughly and permanently connected to the rails or to the wire leading to the outside ground return circuit."

Mr. Ayres said that it was his opinion that in many cases the Underwriters established rules which were too stringent and burdensome. The requirement that truss plank heaters should be mounted so that the current-carrying parts are four inches away from woodwork is certainly unnecessary and absurd. As far as the size of lamp was concerned, he did not see why street railway operators should be limited in the size or the current consumption of incandescent lamps.

Rule 34 of the National Electrical Code, which reads: "Lighting and Power from Railway Wires. Must not be permitted, under any pretense, in the same circuit with trolley wires with a ground return, except in electric railway cars, electric car-houses and their power-stations; nor shall the same dynamo be used for both purposes."

He said that his company had an office building and a number of waiting rooms lighted from its own circuits. This is perfectly proper, and it should not require any special dispensation to do it. The rule ought to be modified so that electric railways could use their circuits for lighting under proper construction anywhere.

Mr. Roberts said he thought the committee should take up the matter of procedure in the case of lightning storms, and also the wiring arrangements of cars laid up in the car-houses at night. He said there should be some standard established, because it has been his experience that different inspectors look upon the installation in an entirely different way.

The report of the Committee on Operating and Storage Car-House Designs was presented.

The report stated that the idea of setting forth the principles of a standard car-house design was dropped because it was shown that, however desirable it might be from some points of view, the standardizing of car-house designs is impracticable for the reason that the outline of a car-house is governed by the size, grade and outline of the lot, the requirements of the road in question, its geographical position, and the ordinances of the city or town in which it is located. The subject is treated in the report by considering the principal problems entering into the designing and operating of storage car-houses.

The discussion of this report was opened by M. Schreiber, who said that the track layout should be made as flexible as possible, and that in yards, if practicable, it is desirable to keep the cars moving head on, irrespective of whether it is necessary to approach the barn in either direction. If the terminal is on a main line, the arrangement of special work should be such that the least interference is presented to regular operation.

To meet present conditions in car-storage houses a three or four-track bay seems to be best suited. This allows a low pitch and short-span roof. The report of the committee states that the three-track bay is objectionable, but Mr. Schreiber considers that this arrangement is sometimes very desirable, especially where the barn is a long one or when in dividing up the property the width does not work out in multiples. He did not agree with the committee in the matter of heating, which considered that the use of hot water was especially meritorious with forced circulation. The report also stated that the heating apparatus should be placed in a room cut off from the remainder of the house by fireproof walls, and should be located centrally with regard to the places to be heated. Mr. Schreiber considered that if the area was large enough to justify a blower system or hot air, that this was the only heating system to install.

Mr. Adams said that he was not quite sure that the committee's recommendation to use flush transfer tables was a good one.

Mr. Winsor said that his company has twenty-four or twenty-five operating houses, and uses nothing but flush transfer tables. The flush table will allow the use of the whole space of the table at night for car storage. There are only a few hours of the day when all the storage room is needed for cars, and this is at a time when cars are not being shifted.

Mr. Lindall did not agree with Mr. Winsor that the flush transfer table was a good thing. It limited the movement of cars in the house at night after the cars are all put in, and handicapped the car-cleaning end of the work.

Mr. Adams called attention to the suggestion in the report which read as follows: "While the Underwriters stipulate that no section of the house shall contain more cars than amount in value to $200,000, the committee believes that no road should expose more than a certain per cent of its rolling stock to the risk of destruction by any one fire, as the loss of cars means the loss of revenue."

He said that the Fire Underwriters desired to limit the figure to a somewhat lower valuation, but that the committee had finally persuaded them to hold up to the $200,000 valuation.

E. W. Olds stated that a considerable advantage would be gained if the companies built their car-storage houses so that one section could be burned out entirely without affecting other portions of the storage area. He also raised the question as to whether the flush transfer table should be recommended for general shop service.

Mr. Lindall replied that the flush transfer table has a decided advantage, inasmuch as material can be handled by trucks across the floor much better than with a pit transfer table. He did not know that there were any other advantages.

The report of the Committee on Way Matters was presented by Mr. Schreiber.

This report included contributions by C. B. Voynow, on "A Proposed New System of Street Railway Construction"; by H. M. Steward, on "The Life of Manganese Steel Rail on Curves," and by Howard F. Weiss, on "The Open-Tank Method of Preserving Timber."

Mr. Voynow's suggestion consists essentially of a track built with a T-rail with a projecting flange above the tread, which would guide the car, and a flangeless wheel. The flange on the rail would take the place of the flange on the wheel with some of the following advantages: The entire system would be of unbroken main line. The manufacture would be simplified, and most of the system could be built of the same rail as straight track. It would cost at least twenty-five per cent less than at present. There would be no possibility of car derailments on account of the tongue kicking or riding on a movable tongue. The rail section would be easy to roll, would conduce to a long life of the head, and the joints would have longer life on account of its being centre-bearing for both car and wagon traffic. The wheel would wear better because it could be chilled through the entire surface, and the chill made deeper. It would be simple to manufacture so far as the casting is concerned, as well as grinding or finishing.

In opening the discussion on Mr. Voynow's contribution, G. L. Wilson said that he thought this form of design would invite all passing teams to use the rail. He did not believe it would be advisable to favor such a radical change in the rail section. He thought that the resistance offered by dirt and obstacles on the track would be much increased, and the liability of derailment greater than at present.

C. Boardman Reed said he thought that on special work, particularly at curves, where guard rails are now required, a rail of the type suggested by Mr. Voynow would have to be renewed much oftener.

W. J. French stated that during the past year, in Utica, N. Y., and also in Syracuse, permission had been secured to use T-rail in the paved streets. These streets are used for ordinary city traffic, and it has been demonstrated that the pavement wears well and that there is no more danger from breakage of wheels than with flat girder rail. Also, the construction is more stable and rational than the girder construction.

R. C. Cram, of New Haven, stated that it has been found that if the authorities can be convinced that T-rail construction is the best for all concerned, the question simply resolves itself into the proper pavement.

Mr. Voynow said that the advantages of this type of rail were hardly appreciated. He would not consider it an ideal rail, but its advantages as far as special work, wheel construction, less exposure

of rail in the street, effect on pavement and noiselessness are concerned, are very great. As to interurban cars entering the cities, all the tracks that are laid at present in cities have the maximum depth of their trams about one and one-quarter to one and one-eighth inches, and interurban cars having a standard wheel flange of one and one-eighth inches can not enter the city tracks. This rail makes provision for such service.

The contribution by Mr. Weiss to this report was presented, and the author explained that the only companies that have really taken the question of wood preserving up on a practical basis are some electrical companies in California. The working outfit costs about $400, including a tank with a second-hand boiler and pump. The various preservatives are injected into the body of the pole. The Government simply carries out the work to the point of proving its value to the companies.

This contribution to the report created considerable discussion. Ernest F. Hartmann stated that the application of a preservative is better than applying an oil paint. Oil is a preservative, but it is also a vegetable compound and decays the same as any other vegetable matter. The antiseptic action of any preservative material on partially decayed wood will help to a considerable extent. The Boston Elevated Railway Company is treating its ties by the open-tank immersion process, and it costs the company from sixteen to eighteen cents per tie. Something like 90,000 ties have been treated, and it is understood that the results are entirely satisfactory. Crossarms have been treated at Bangor at a cost of $8.68 per thousand feet. At Norfolk gum trees have been treated by the open-tank method, at a cost of twenty-three cents per tie. At Columbus, Ga., the cost of treatment is thirty-one cents per tie. At Denver the cost of treatment is seventeen cents per tie.

Mr. Cram said that his experience had taught him that it is not a good thing to treat green timber with any kind of preservative process.

Mr. Hartmann replied that the trouble with this installation was that no provision was allowed for drainage, and that when the blocks became thoroughly wet they split up. If the wood-block pavement were properly grouted there would be no trouble.

FRIDAY AFTERNOON SESSION.

It was decided to pass over the discussion of the question box, and the first business of the afternoon session was the hearing of the report of the Committee on Economical Maintenance.

The report recommends that, under average conditions, the practice of shopping car bodies for general overhauling yearly is the most economical. The committee recommends that the replacement of steel tires or steel-tired wheels with rolled-steel wheels be given careful consideration. The report also suggests that where track and special work is particularly severe on flanges, and where conditions permit a material reduction in the diameter of the wheels by wear, the rolled-steel wheel may be found to be more economical than the cast chilled wheel. The committee feels that there is general need of better knowledge on the part of persons responsible for the use of material as to the most suitable material for the purpose required and the checking of such material to determine its quality. It is suggested that the association could do valuable work in the preparation of suitable specifications for materials, and recommends for consideration the appointment of committees for this work. The committee is so convinced of the necessity of a system of accounting which would show the minimum average and maximum costs of maintenance for various classes of equipment that it recommends the appointment of a committee jointly with a committee from the Accountants' association for the purpose of giving this subject thorough consideration.

This report was discussed at length, it being the consensus of opinion that standard specifications for the purchase of material would help the purchasing agents very materially in securing the best material at uniform prices. The suggestions for the establishment of standard forms of accounting would also allow a comparison of maintenance charges, which would effect great economies in every system.

Following the discussion of this report, several amendments to the constitution and by-laws were made.

The report of the nominating committee was presented as follows: President, Paul Winsor, Boston; first vice-president, F. H. Lincoln, Philadelphia; second vice-president, W. H. Evans, Buffalo; third vice-president, W. J. Harvie, Utica, N. Y.; secretary and treasurer, John W. Corning, Boston. Executive committee: William Roberts, E. O. Ackerman, L. L. Smith, Martin Schreiber.

It was voted that the secretary be authorized to cast one ballot for these candidates.

On motion of Mr. Roberts a cordial vote of thanks was extended to Mr. Simmons, the retiring president, for the able and courteous manner in which he had conducted the affairs of the association.

President-elect Winsor was escorted to the chair and addressed the members briefly, after which the convention was adjourned.

The American Street and Interurban Railway Transportation and Traffic Association.

Report of the Wednesday and Thursday Sessions of the Convention Held at Atlantic City, N. J., October 12 to 16.

THE report of the Monday and Tuesday sessions of the American Street and Interurban Railway Transportation and Traffic Association was printed in the last issue of the ELECTRICAL REVIEW.

The Wednesday session was called to order at 10 A. M. with President Allen in the chair.

The discussion of the report of the Committee on Electric Mail Service was opened by Gen. O. H. Harries. This report, which was compiled by C. H. Hile, was composed largely of extracts from the United States Post-Office Department reports on electric railway mail service. This indicated the general opinion of the Government with regard to the compensation which should be allowed electric railway companies for the carrying of United States mail.

General Harries pointed out that the electric railways did not carry, as a rule, any other variety of business at a loss. There was no reason why the electric carrier should discriminate in favor of the Government, but he stated that very little could be accomplished as long as the electric railways continued to carry the mails at the present rate. So long as one company accepts mail at a low rate, this rate will be made the average compensation to all the others. There will be no action by Congress either so long as companies are found who will carry mail at the existing rate. The blame for this condition rests on the carrier, who insists on doing business without profit. The only remedy for this condition is for all the companies to refuse to accept contracts on the present basis.

Mr. Hippee stated that his company, in Des Moines, Iowa, carried United States mail in pouches and also carried four mail boxes on each car. The mail is collected at the main station by Government collectors and mail carriers, and the pouch mail is carried to substations and to the eastern side of the city. The mail is put on the cars by a representative of the Post-Office Department, and taken off the cars by one. The company receives compensation at the rate of three cents per mile for closed-pouch service. There is no limit to the number of pouches that can be carried, except that there is a general understanding with the

postmaster that a car shall not carry more than three or four pouches on the front platform.

Mr. Brady, of Anderson, Ind., stated that the Indiana Union Traction Company has had a limited experience in handling material on interurban lines. It has two contracts, both of long standing, one of which involves the handling of mail by pouches from Anderson to Alexandria, a distance of about ten miles, and for which compensation is received at the rate of three cents per mile. The total compensation is between $45 and $50 per month, which is lessened somewhat by an occasional fine. Both cities have been growing, and the mail-pouch service is being extended considerably. It has been found, however, that although the service has extended several miles further, and the amount of mail that is carried has been doubled since the beginning of the contract, no extra compensation has been received.

After considerable discussion it seemed to be the consensus of opinion that there should be some strong action taken, looking to a more equitable compensation for the carrying of mail, notwithstanding the fact that it was appreciated that this was a sort of accommodation which was naturally undertaken by a public service company.

The report of the Committee on Freight and Express Service was presented, and this was supplemented by a paper entitled "Progress to Date in Carrying Freight and Express Matter by Electric Roads—Some Mistakes That Have Been Made and Their Remedy," which was prepared by C. V. Wood. The report and paper were read by G. W. Parker.

The discussion was opened by E. H. Hyman, general manager of the Cleveland Traction Company. Mr. Hyman said that the whole question of freight and express service depends entirely upon local conditions. If either freight or express business is carried on in the right locality it can be made to earn money, but both services can not be carried on in one locality at a profit. Where one system attempts to operate both freight and express service there is always the liability of contention among the shippers and always confusion regarding the shipments.

B. E. Wilson said that if the road has terminal facilities such that it can handle car-load lots, and sidings that will hold trains of four or five cars, it should attempt to do business on a car-load basis; but where the road has small sidings and is not allowed to move ordinary box cars into a city, it is positively out of the question for it to consider car-load business.

During the discussion of this report the matter of the jurisdiction of the Interstate Commerce Commission came up with regard to the receipt and billing of freight or express from adjacent states. George R. Folds, of the West Penn Railways Company, Connellsville, Pa., stated that a ruling had been handed him by the commission which indicated that if the company handled any traffic which originated outside of the state, the company was under the jurisdiction of the Interstate Commerce Commission, and must comply with its regulations. It would appear that this ruling took a very broad view of the situation, including passengers, express and freight.

H. A. Nicholl, of the Indiana Union Traction Company, stated that the system handles general merchandise in less than car-load lots. In a few instances car-load lots are handled, mainly in the shape of live stock. All of the freight cars are operated as extra trains, and no attempt is made to schedule these trains. Most of the freight business is handled at night, so as to avoid the congestion of the road during the business hours of the day. At the larger terminals the company has its own freight houses and ample side tracks. These are in charge of salaried freight agents, and at the smaller stations the freight is handled jointly with the passenger. Commissions are paid to the agents for this purpose. The company has a well-organized freight department, consisting of a general freight agent and two division freight agents. These men not only solicit business, but take care of the filing of the tariffs, with general oversight of the whole business. The company does not interchange freight with the steam roads. It does, however, with other electric systems. In some instances it operates through trains over other electric lines. The earnings per car per day average about $60. The freight business is operated on a fifty-five per cent basis, and the company earns about four to five cents per mile. The freight business represents about eight per cent of the gross receipts. The company charges to its freight account about every conceivable thing it thinks belongs to the freight department.

In respect to express, the company operates a merchants' despatch, which resembles, along practical lines, express business. For this service a rate of one and one-half times the first-class freight rate is charged. The company does not have a pick-up or delivery business, and it appears that the express business does not interfere with the freight business in any way.

The discussion of the Interstate Commerce Commission rulings was again taken up, several members pointing out the necessity of taking issue with some of these rulings.

P. P. Crafts discussed the experience of the Iowa & Illinois Railway Company with regard to its express and freight business. The company has a contract with the American Express Company on a tonnage basis, and hauls all of the American Express business originating on the Chicago & Northwestern Railway Company into Clinton. The company does not permit the express company to do any local business between the railway company's termini or along the line. A compensation of twenty cents per 100 pounds is received. No compensation is received for articles such as are carried in messengers' safes, nor for currency handled.

With regard to freight business, the company handles about three and one-half car-loads of freight per day. About fifty per cent of this is local, and the balance is part of through shipments which go west on the Chicago & Northwestern from Clinton.

The symposium on the "Possibilities of a Well-Conducted Publicity Department" was taken up, Mr. Warnock presiding.

Mr. Warnock pointed out the conditions which had led to the formation of publicity bureaus by the public service corporations, and emphasized the considerable good which was being effected by having men properly equipped to handle news in such a way that it would be put into the daily press without perversion, and would form the best means of putting to rest the generally unfavorably conception which the ordinary citizen has of the railway company.

The first paper on this subject was presented by Charles E. Flagg, of the department of publicity of the Inland Empire System, Spokane, Wash.

Mr. Flagg considers that the possibilities of a railway's department of publicity depend largely upon the natural environments. The city of Spokane has something over 100,000 population, with five transcontinental railroads, 104 miles of city traction lines, and 200 miles of interurban electric railroads. The Inland Empire System, which now has 225 miles in operation, began less than five years ago as the Spokane Traction Company, city lines, and the Coeur d'Alene & Spokane Railway, interurban lines, between Spokane, Wash., and Coeur d'Alene, Ida. In the matter of publicity, the company uses the daily newspapers, illustrated folders, official time tables and maps, enlarged photos, billboards, street cars, post cards, souvenirs and any other means that appeals to the publicity department as opportune and likely to bring results.

It has been found most practicable to use good-sized display spaces in the evening papers and reading notices in the morning papers. In each suburban town through which the lines pass a small display is run in the weekly newspapers, consisting of a local time table varied with announcements regarding excursion and colonists' rates to and from the East. In the preparation of folder copy, the illustrations are made as large as possible and the type matter brief and concise.

Mr. Flagg advocates picture advertising as one of the most convincing means of publicity. The best views are selected for enlarging, and these are framed and hung in depots and in good locations in public buildings. There are also complete photo albums in the general passenger and publicity departments, as well as on parlor cars.

Mr. Flagg was followed by B. R.

Stephens, of the Illinois Traction System, of Springfield, Ill.

Mr. Stephens described the publicity department of the Illinois Traction System. He believes thoroughly in the use of newspaper space for the publication of time cards and also endorsed the use of folders.

Concerning the expenditure for a publicity department, Mr. Stephens said that on steam roads, as a general rule, an allowance is made in the operating expense of two per cent of the gross passenger earnings for publicity purposes. On interurban roads it would appear that approximately one-quarter of this amount, or one-half of one per cent, is the allowance made for the purpose.

The meeting was then adjourned until Thursday morning.

THURSDAY MORNING SESSION.

The first business of the Thursday morning session was the reading of three papers on the "Possibilities of a Well-Conducted Publicity Department," by George Sabin Brush, of the Boston Elevated Railway Company; Charles W. Lamb, advertising expert, and G. H. Gall.

The discussion on these papers was opened by the reading of a communication from William A. House, president of the United Railways and Electric Company, Baltimore, Md.

Mr. House considers that a publicity department is a welcome step forward in the public service corporation. It is beginning to be realized that the best paying policy is to deal liberally and fairly with patrons and encourage a spirit of co-operation. The adoption of a liberal, progressive and generous policy, backed by a thoroughly organized and enlightened publicity department, was recommended by Mr. House as one of the surest ways to avoid the criticisms so frequently indulged in at the expense of the corporation.

E. A. Kendrick, secretary of the Matthews-Northrup Works, Buffalo, N. Y., made a brief address on the subject of advertising and printed matter.

The discussion on these papers was closed by H. A. Faulkner, passenger agent of the Boston & Northern Railroad, of Boston. Mr. Faulkner considers that it is the best policy to treat the newspapers very squarely, and if this is the practice of the corporation, much good can be secured. He described the information bureau which his company had established, which is under the direction of the passenger department and located with the other railroad offices. This information bureau is fitted up with every kind of literary information, and the attempt is made to get hold of not only what is interesting concerning the company's own system, but everything connected with a scenic effect or railroad situation outside of the New England States. The clerks are instructed to give absolutely impartial information, whether the inquiry is concerning the company's lines or competing lines. Although Mr. Faulkner is an old newspaper man and appreciates very highly their value, he does not place them first in importance for the special uses of the street railway man. He considers that the company's own cars are the best advertising medium that can be found and that as an advertising medium they should be used to the limit. In his system the division superintendents keep the publicity department informed concerning festivities occurring in any locality, and the attempt is made through dasher signs to promote travel in these directions. One of the most valuable publications of the Boston & Northern company is called the "Tri-State Tourist." Forty thousand copies of this are issued per month, and distributed at various points on the company's system in three states.

The report of the Committee on Interurban Rules was presented by J. N. Shannahan.

This report is based on the book of rules adopted at the Columbus convention in 1906. The committee has aimed to harmonize as closely as possible the codes adopted by the various associations during the past two years, and the rules include codes adopted by the Central Electric Railway Association, the New York State Street Railway Association, and the rules of the operating Indiana companies. The committee recommends that the association direct the incoming Committee on Interurban Rules to co-operate with a committee to be appointed by the Railway Signal Association in formulating a new code governing the use of semaphore signals.

It was voted to receive the communication as a progress report and that the committee be continued.

After considerable further discussion of the report it was voted to extend the authority of the present standing committee on interurban rules so that the committee might confer with various public service commissions throughout the United States, and, in its discretion, distribute copies of the rules as presented by the committee.

The report of the Committee on the Operation of Multiple-Car Trains on Interurban Roads was presented by D. F. Carver.

Owing to the lateness of the hour there was no discussion upon this report.

The reports of the Committee on Passenger Traffic and of the Committee on Rules for City Operation were received and written discussion requested.

The report of the nominating committee was presented as follows: President, C. Loomis Allen; first vice-president, R. T. Todd; second vice-president, G. L. Radcliffe; third vice-president, A. W. Warnock. Executive committee: the officers, and G. W. Parker, Detroit, Mich.; H. C. Page, Springfield, Mass.; N. W. Bolen, Newark, N. J.; H. A. Davis, Nashville, Tenn. This report was unanimously adopted and the gentlemen named declared elected.

Mr. Shannahan and Mr. Brush were named as a committee to escort Mr. Allen to the chair, and after a few remarks by the president-elect the convention stood adjourned.

Meeting of the Pittsburg Section of the American Institute of Electrical Engineers.

The regular October meeting of the Pittsburg section of the American Institute of Electrical Engineers was held in the lecture hall of the Carnegie Institute, Pittsburg, Pa., October 13.

The evening was devoted to the presentation and discussion of two original papers. The subject of the first paper was "The Oscillograph and Some of Its Uses," by H. H. Galleher, engineer of the high-tension testing laboratory of the Westinghouse Electric and Manufacturing Company, and the second one was entitled "The Testing of Large Alternating-Current Generators," by L. E. Schumacher, of the dynamo testing department of the same company. The papers were illustrated by lantern slides.

Mr. Galleher's paper dealt with the practical application of the oscillograph to everyday problems and explained its general construction, operation, adjustment and repairs.

Professor S. M. Denton, of the Carnegie Institute, supplemented Mr. Galleher's paper with a talk on the application of the oscillograph to the solving of complex problems in phase relation, and showed how essential this instrument has become in large power-transmission plants as a means of explaining perplexing phenomena. He advocated the purchase of such instruments by high-tension central stations generally.

Mr. Denton then gave an interesting description of the Irwin hot-wire oscillograph, which, he stated, gives great promise as a cheap and sufficiently accurate instrument for such purposes.

The subject was further discussed by R. P. Jackson, S. M. Kintner and A. W. Copley.

Mr. Schumacher's paper dealt particularly with the tests on the large 8,770-kilowatt, 12,000-volt, three-phase generators of the Ontario Power Company at Niagara Falls, which were tested after erection. The methods of testing and some results were given.

The paper was discussed by P. M. Lincoln, W. L. Waters, F. D. Newbury and C. Renshaw, special comment being made on the water rheostat and the use of temperature coils to ascertain temperatures in places where thermometers could not be used.

The next meeting will be held early in November, the subject being "Electricity in Mines," by George R. Wood, consulting engineer. This subject is of great interest just at present in the Pittsburg territory.

The New Haven Electrification.

William S. Murray, electrical engineer of the New York, New Haven & Hartford Railroad Company, which has been operating the Westinghouse single-phase electric railway system on a part of its lines during the last two years, in discussing its experiences with electrification, says:

"The most commercially valuable answer as to the success of electrification on the New Haven is written in the actual operating schedule in the electrification zone. The train minute delays suffered to-day by electrical operation are but a small percentage of those incurred during the period of steam operation.

"As the zone limits in our case were not a terminal proposition, the application of the direct current showed itself to be impracticable. On account of errors, always common of initiative work, the first few months' operation has been a period of interruption which has naturally been annoying both to the road and the public. To-day the delays have disappeared by the removal of their cause.

"The wisdom of the purchase of a locomotive consisting of two individual half units, the whole or half unit being operative by a single crew, has proved itself in the ability of the road to handle seventy-five per cent of traffic with half-unit locomotives, using the whole unit on the remaining twenty-five per cent of trains, whose weight demands the full drawbar. Should future requirements see the advantage of extension of electrification east of Stamford, the system is designedly applicable.

"As to the saving in cost of operation as compared with steam, I would state that operation to-day has not been a sufficient length of time to make this comparison. It may be interesting to note, however, that by exhaustive investigation I have found that one pound of coal burned under the boilers of our central station produces twice the drawbar obtained by one pound of coal burned in the fire boxes of the steam locomotive, or in other words, the fuel bill for electric traction is one-half of that required for steam traction. Other economies will arrive in the low cost of maintenance and repairs of the electric locomotive as against steam locomotives.

"The density of traffic is, of course, the paramount feature as to the savings to be effected by electrification. It is not to be forgotten that, in electrifying, interest, depreciation, insurance and taxes follow closely on the heels of the capital investment in equipment and material necessary to electric operation. The heavier the traffic, the greater will be the economies derived from the two above-mentioned sources.

"It is quite conceivable that the heavy ton-mileage in freight and passenger service on the Atlantic coast line roads will effect savings sufficient to cover the above-mentioned fixed charges on the investment necessary to their electrification.

"The greatest value to be experienced by electrification will be in the tremendously increased traffic capacity of the present track mileages, due to the facility electricity offers in making rapid main line and yard train movement, or, stated in another way, it is thus immediately seen that electrification will permit a tremendous increase of traffic without an increase of track mileage, and thus roads which are up against the requirement of handling their congested traffic by laying new tracks, which, of course, is a most expensive procedure on account of right-of-way difficulties, will be led into providing an equal capacity by electrification of the old trackage."

American Institute of Electrical Engineers' Papers.

To the Editor of the Electrical Review:

About a year or so ago I read an editorial in the Electrical Review regarding the papers read before the American Institute of Electrical Engineers. It was suggested that the number of papers be cut down to one per meeting, together with prepared discussion on same. By such adoption the Papers Committee would have a wider range of choice to select the best papers available, which, in turn, would mean that the authors would be better prepared for questions and answers, and papers would not be read at all which were presented with the apology that they were prepared at the eleventh hour.

It is a great pleasure to note that in this month's proceedings of the American Institute of Electrical Engineers, "the Meetings and Papers Committees propose to accept but one paper for each meeting during the present season, to be followed by prepared discussion."

Supplementary to same, I respectfully suggest the following two points for the assumed benefit of the engineering profession in general:

First, that the Committee on Papers confer with engineers, whether members or not, and secure by invitation, in concrete form, compact researches and studies on subjects covering a wide range, with numerous comparisons drawn.

Second, to invite engineers who are up to date in European practice to present papers on modern European subjects.

Practically all the papers read before the American Institute of Electrical Engineers are of domestic practice; my observation during seven years' residence in the United States is that many of these papers contain what are apparently basic features, but which have existed in Europe for a number of years in every-day practice.

In connection with my latter suggestion it must be borne in mind that the early familiarization with European ingenuities greatly facilitates domestic problems. Further, as an example, permit me to call attention to the fact that the papers presented to the Verein Deutscher Ingenieure (German Society of Engineers) comprise about twenty per cent of foreign, especially American, topics. In addition it is recognized abroad, also to a certain extent in this country, that the European engineer reads more American technical literature than *vice versa.*

What we need is a more frequent and friendly interchange of ideas whereby we can profit from one another. The advantage is fully recognized by competent engineers who make studies abroad to ascertain conditions there. That the argument is not one-sided is shown also by the trips of foreign commissions sent here to study our methods.

Frank Koester.

New York, October 20.

Hudson River Electric Power Reorganization.

The reorganizing committee which has undertaken to readjust the affairs of the Hudson River Electric Power Company in order to meet its financial obligations, has announced the terms of the agreement under which the holders of the $5,000,000 of bonds, whose interest has been in default since August 1, are invited to submit their holdings for participation in the reorganizing plan which is to be announced later.

The bondholders' committee in its original announcement provided that "if the final plan which the committee proposes to submit does not meet with their approval, said depositors may withdraw their bonds within ten days after written notice that fifty-one per cent in face value of the depositors have adopted the plan."

THE KERR MILLS OF THE AMERICAN THREAD COMPANY, FALL RIVER, MASS.

A DESCRIPTION OF THE NEW STEAM TURBINE POWER PLANT.

In the early part of 1907 the American Thread Company decided to make an addition to its plant at Fall River. The old plant consisted of a spinning and twisting mill, dye and gassing house. The power for the main mill was derived from a double tandem-compound engine of about 1,600 indicated horse-power; and the dye and gassing houses were driven by small engines, the power from these and the main engine being distributed throughout the various mills by belts and shafting.

It was decided to drive the new mill electrically, principally on account of the probability that, as the business increased, various additions would have to be made, and the electrical drive lends itself particularly well to this end.

The building of the new plant necessitated the complete rearrangement of the machinery in the old main mill.

It was first proposed to merely make a new arrangement of the shafts and belts, and at some future time—when it became necessary to install a new engine—to change to electrical drive. An accident, which might have had serious results, occurred to the main engine before this plan had been carried out, which decided the management to abandon the engine and immediately install electric drive, not only in the new mill but in the old mill as well. The new power-house described in this article was, therefore, designed to furnish power for the complete plant and is arranged so that it can be conveniently enlarged to care for future power requirements.

The power-house is located on South Watuppa Pond. The tracks of the New York, New Haven & Hartford Railroad run between the power-house and the pond, cutting off a small body of water from the main pond. Connection was made with the main pond at two points, the water being brought into the power-house through one of these connections and a trench, and the water from the condensers flowing into the small pond and thence under the railroad, through the other connection, into the main pond. These connections were placed some distance apart so that the used water would have no tendency to return to the power-house.

The power-house building consists of a turbine room, forty-three feet by fifty-six feet, and a boiler room, fifty-eight feet by 132 feet. The building is of brick with concrete floors and roofs. The boiler room contains twelve horizontal tubular boilers built by the Bigelow Company, of New Haven, Ct., each rated at 200 horse-power. These boilers are hung from beam supports and are brick set, the setting being arranged so that superheaters can be installed in the rear end of the setting. Three Foster superheaters have been installed for the purpose of testing their durability and efficiency. The gases from each battery of six boilers pass through a flue to a Green fuel economizer and thence to the chimney. The flue back of each battery is arranged so that the gases can either pass to the chimney or through the economizers.

All of the boilers are arranged for burning low grades of fuel and are equipped with "Parsons" blowers and arrangement of setting.

A Warren Webster open feed-water heater and purifier is located at the end of the boiler room next to the turbine room.

Two skylights are placed in the roof of the boiler room, one over the firing space and one over the tops of the boilers.

The wall opposite the front of the boilers and back of the firing space is made of galvanized iron, as any future addition to this boiler room will be a duplication of the present layout, the new boilers facing the present ones.

The boiler-room floor is level with the yard. Coal will be brought from the storage piles by a conveyer system and dropped in front of the boilers.

The steam piping is arranged so that superheated or saturated steam can be supplied to the turbines or to the auxiliaries, either separately or in conjunction. This arrangement was made primarily for use in testing the efficiency of the different types of apparatus.

The feed water is delivered to the open heater and purifier and is then pumped to the boilers. The feed-water main is of cast iron and so arranged that water can be supplied either from the pond or from the heater and purifier, and delivered directly to the boilers or through the economizer.

The drips from all of the high-pressure steam mains are collected at one point and from there returned to the boilers by the Holly return system.

The turbine room has two floors, but the upper floor where the turbines are located does not extend over the space occupied by the pumps. This space was left open so that the traveling crane, which is of ten tons' capacity and built by the Northern Engineering Company, could be utilized in installing and repairing the auxiliaries as well as the turbines.

The turbine room contains two 1,500-kilowatt Allis-Chalmers alternating-current, turbo-generators; two General Electric seventy-five-kilowatt, direct-current, turbo-generator exciters, and a General Electric switchboard. This apparatus is located upon the upper-floor level.

Incorporated in the main turbines are the various patented features controlled by the builder, the Allis-Chalmers Company, among which may be mentioned channel-shaped shrouds protecting the ends of the blading from injury; machine-cut slots in the foundation rings insuring accurate spacing of the blades; a method of fastening the latter which effectually prevents them from working loose, and improved balance pistons. Other details of special interest will be mentioned briefly under the subjects to which they belong.

The turbines operate at 1,800 revolutions per minute, with a steam pressure of 150 pounds at the throttle, dry saturated, and a vacuum of twenty-eight inches of mercury referred to thirty inches barometer at the exhaust nozzle. Large temporary overload capacity has been provided for in the design of these machines; high efficiency is maintained, and close regulation secured, even under the most unfavorable operating conditions.

The bedplate is divided into two parts, one carrying the low-pressure end of the turbine. The turbine is secured to the former, while the latter is provided with guides which permit the end of the turbine to slide back and forth with differences of expansion caused by varying temperature, at the same time maintaining the alignment.

The "Bulkley" condensers are located outside the building.

The speed of each turbine is regulated within close limits by a governor driven from the shaft through cut gears working in an oil bath. This governor, by means of a relay operates a balanced throttle valve. The entire mechanism is so proportioned as to respond at once to variation of load, but its sensitiveness is kept within such bounds as to secure the best results in the parallel operation of the two turbo-generators in this station. The governors can be adjusted for speed while the turbines are running, thereby facilitating the synchronizing of the generators

and dividing the load as may be desired. In order to provide for any possible accidental derangement of the main governing mechanism, there is an entirely separate safety or over-speed governor. This governor is driven directly by the turbine shaft without the intervention of gearing, and is so arranged and adjusted that if the turbines should reach a predetermined speed above that for which the main governor is set, the safety governor will come into action and trip a valve, shutting off the steam and stopping the turbine.

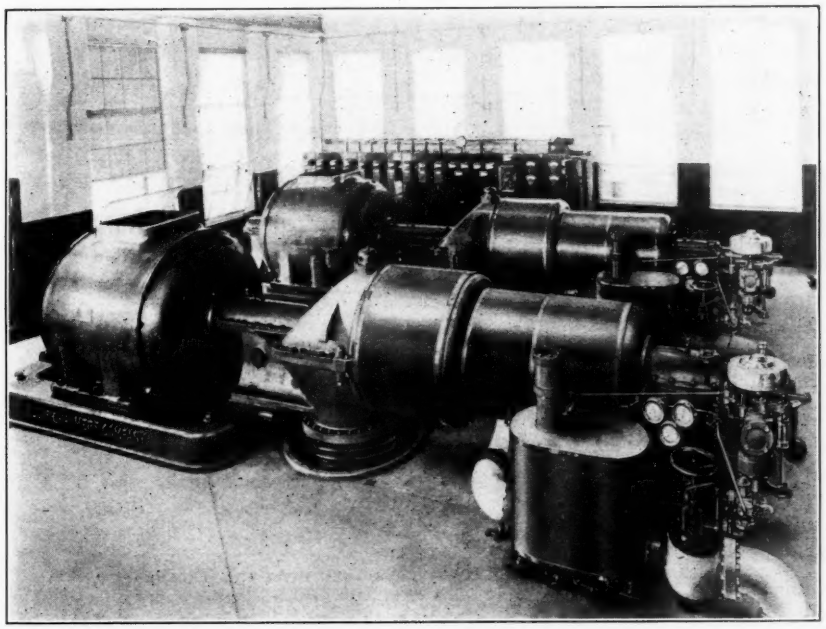
The bearings are of the self-adjusting ball and socket pattern, especially designed for high speed.

The lubrication of the four bearings, two for the turbine and two for the generator, is effected by supplying an abundance of oil to the middle of each bearing by means of a small cycloidal pump driven from the turbine shaft, and allowing it to flow out at the ends. The oil is passed through a tubular cooler with water circulation, and pumped back to the bearings.

It is not necessary to supply the bearings with oil under pressure, but only at a head sufficient to enable it to run to and through the bearings, this head never exceeding a few feet. No oil of any kind is used in the interior of the machines nor in the glands through which their shafts pass. Low oil alarms have been provided for the turbines.

The hot parts of each turbine up to the exhaust chamber are covered with an ample thickness of non-conducting material and lagged with planished steel, so applied that it may be easily removed. The non-conducting covering is also removable at the cylinder joint to facilitate the opening of the turbine for examination.

Between the turbine and its generator a special type of flexible coupling is used to provide for any slight inequality in the alignment of the bearings, to permit axial adjustment of the turbine spindle, and to allow for difference in expansion. This coupling is so made that it can be readily disconnected for the removal of the turbine spindle or of the revolving field of the generator. Provision is made for ample lubrication of the adjoining faces of the coupling.



TWO 1,500-KILOWATT ALLIS-CHALMERS STEAM TURBINES AND GENERATORS IN THE KERR MILLS OF THE AMERICAN THREAD COMPANY.

The revolving-field alternators driven by these turbines are of the Allis-Chalmers Company's standard type, designed for high efficiency and safe operation at high peripheral speeds. Some of the principal advantages embodied in their construction are summarized as follows:

The field core is built up of steel discs, each in one piece, giving high magnetic permeability and great strength. Coils are placed in radial slots, thereby avoiding side pressure on slot insulation and the complex stresses resulting from centrifugal force, which, in these rotors, act normal to the flat surface of the strip windings. Bronze wedges hold the coils firmly in the slots, making the surface of the rotor a smooth cylinder, reducing windage losses and insuring quick operation. The end connections are securely held by chrome-nickel steel rings.

The stator is completely enclosed, eliminating noise of operation. Coils were completely wound and insulated before being placed on the core, thus obviating the risk of defective insulation. Stator windings are placed in open slots, rendering the coils readily removable. End connections are firmly braced, preventing deformation of coils in case of short-circuit.

For the purpose of obtaining adequate ventilation and for muffling the noise produced by the circulation of the air, the turbo-generators are enclosed in such a manner that the air is taken in at the ends through fans mounted on the rotor shaft which discharge it over the end connections of the armature coils into the bottom of the machine, whence it passes through the ventilating ducts of the core to an opening at the top. This patented system of ventilation is most efficient.

On the lower floor of the turbine room are two engine-driven Lawrence centrifugal pumps for condensing water, one Blake 1,000-gallon Underwriters fire pump, one electrically driven Deane triplex power pump for sanitary water for the mills, one Fairbanks-Morse duplex steam-tank pump for water supply to the heater and purifier, one engine-driven Deane triplex power pump and one Heisler duplex steam pump for boiler-feeding purposes.

The engine-driven triplex boiler-feed pump is arranged so that it is automatically controlled by the opening and closing of the boiler feed valves, a constant pressure being maintained on the feed line. Any lowering or raising of this pressure causes the pump to run faster or slower according to the demand for water.

The switchboard is located on the same floor as the turbines and consists of two panels controlling the exciters, two panels for the main turbo-generators, one panel for a Tirrill regulator, seven panels for the power circuits and one panel connected to the lighting circuits.

This switchboard has a complete equipment of instruments and all switches are oil-immersed, except the main generator switches, which are solenoid-operated circuit-breakers. The feeder mains are carried under ground to each mill through fibre conduits.

Taken all in all, this plant is very complete, being so designed as to secure both maximum economy and low operating costs. The plans for it were made and its construction superintended by S. M. Green, consulting engineer, of Holyoke, Mass.

REVIEWS OF CURRENT ENGINEERING AND SCIENTIFIC LITERATURE

System of Simultaneous Telegraphy and Telephony Over Telegraph Wires.

Experiments made by Aurio Carletti under the auspices of the Italian Telegraph Department between Caserta and Piedimonti are here described. The work was undertaken for the purpose of testing the Perego separator of simultaneous telegraphic and telephonic messages, but the device was found unsuitable for use between any two subscribers and could only be employed between the two offices at the extreme ends of the line. Better results were obtained with the arrangement shown herewith. The telegraph currents are separated from the telephone currents by means of a condenser C; T is a telephone transformer of the kind usually employed for connecting a single-wire to a double-wire line; *j* is the jack at the switchboard. In order to make the variable period of the telegraph currents slower and deaden the noise produced by them in the telephone receiver the well-known arrangement of Van Rysselgerghe was employed, which consists chiefly of a coil *g* with strong self-induction connected in series with the line, and of a condenser C of two microfarads in multiple with the line. The coil *g* also serves for resisting the leakage of the telephone currents through the telegraph apparatus, the coil acting in this case as an impedance against the high-frequency telephone currents, so that they will pass preferably through the condenser C and the secondary of the transformer T. To the telegraphic currents, on the other hand, which are continuous, the coil *g* offers only its ohmic resistance. This arrangement gave good results and permitted communication from Piedimonti with subscribers in Caserta, Naples and Rome. However, there still was a considerable leakage of current through the telegraph instrument, which was detrimental. One way of reducing this leakage was to increase the impedance of *g*, but that would have disturbed the telegraph service too much. Furthermore, the impedance depends chiefly on the frequency, and consequently the leakage of the telephone currents will not be equal for all harmonics: it will be greater for the lower sounds and smaller for the higher ones, and thus the voice will be distorted. Another cause of serious disturbance is the intermittent exclusion of the telegraph receiving circuit. In the receiving position the electromagnet of the telegraph instrument will be in series with the coil *g* and add its impedance thereto; in the transmitting position the line is connected to the battery and the telephone currents can leak away freely through the battery, and thus the telephone current will be alternately weak and strong. To remove this difficulty an impedance coil might be inserted between the telegraph key and the battery, but this arrangement would be too complicated and would greatly increase the resistance and inductance of the telegraph circuit. A simpler artifice, which gives the same results, is to put the telegraph receiver in series with the line. In this case the Morse receiver acts also as an impedance, and therefore the coil *g* may be eliminated. An arrangement which has not yet been sufficiently tested, but which might completely remove all the difficulties referred to is to put the transformer T in series with the telegraph line. In this manner all the telephone current is utilized, because it passes entirely through the transformer T, while in the arrangement shown herewith only a part of it passes through the transformer and the remainder escapes at A through the telegraph receiving group. The arrangements described are not suitable when the telegraph wires are disturbed by industrial currents.—*Abstracted and translated from L'Elletricista (Rome), September* 1.

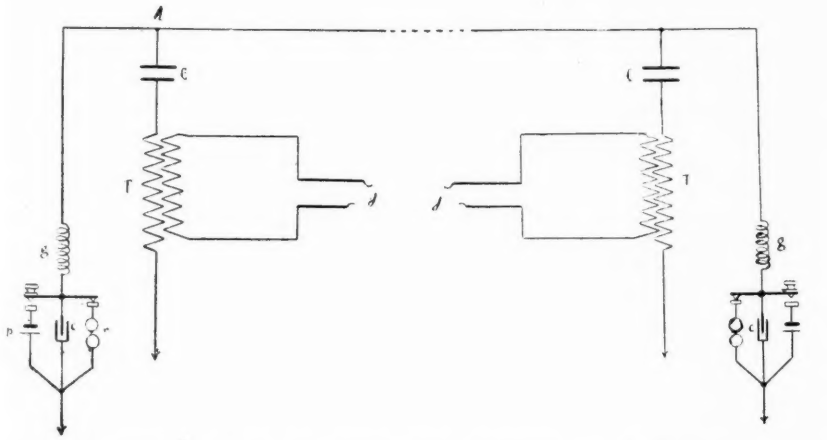


Diagram of Circuit for Simultaneous Telephony and Telegraphy.

Effect of Wireless Telegraph Transmission on a Telephone System.

In the north of England a wireless telegraph station recently caused considerable trouble to the local telephone exchange. The telephone circuit was provided originally with an aerial line, two spans of which came within the staying ground of the wireless mast, which is 225 feet high. These wires were not adjacent to or parallel with any leads or wires of the radio-telegraph system. The telephone wires were twisted in the usual way, and immediately outside the station grounds were connected with wires for other local subscribers. Originally the telephone circuit was provided with a battery at the station for signaling purposes, both wires being used for signaling as well as for speaking. At the wireless station the spark system was in use, absorbing several kilowatts of energy. Not only was the speaking difficult from the telephone station itself, but other circuits traversing the same routes were seriously interfered with and false rings were received from time to time by various subscribers, and sparking was also observed at the telephone exchange. Arrangements were made to substitute cable for the aerial line on the station grounds. Meanwhile the local telephone system was changed over to common battery working. This greatly

accentuated the difficulty, due, no doubt, to the fact that one of the wires was normally joined to earth for signaling purposes. The disturbance to speaking was not increased, but the heat coils at the exchange were continually being burned out. The lightning protectors were also affected. A lead-covered cable was buried in the ground and terminated a few yards from the hut by means of unsheathed cable. This reduced the disturbance considerably but did not entirely overcome it. Finally the lead-covered cable had to be extended into the hut and terminated close to the telephone instrument before the difficulty was entirely overcome. At the wireless station an arc system was installed, but no difficulty was experienced with the undue oscillations. —*Abstracted from the Post Office Electrical Engineers' Journal (London), October.*

The Arc Between Identical Electrodes as a Rectifier.

Dr. Johann Sahulka describes some investigations of the rectifying effect of an alternating-current electric arc. In his previous writings he has pointed out that such an effect takes place not only in an arc between dissimilar electrodes, but also, though in a smaller degree, between electrodes of identical material, as carbon, for instance, if they do not have the same dimension or position. With an arc between two equally thick carbons in a vertical position the lower one is always electrified positively toward the upper one, so that outside of the arc a direct current flows in the direction from the lower to the upper one. The difference of potential of the rectified current depends on the intensity of the alternating current; with homogeneous carbon rods, seven millimetres in diameter, it amounted to a maximum of 2.8 volts. If the alternating-current arc is produced between two electrodes of different thicknesses the thinner carbon rod is always electrified positively toward the thicker one; the potential of the rectified current depends on the current intensity and position of the carbons. The alternating-current arc between two identical electrodes is always predominatingly negative toward both electrodes, so that in a branch circuit between either one of the electrodes and a test rod inserted into the arc a strong direct current is obtained. The manifestation of a direct current in an alternating-current arc between two identical electrodes is explained by the unequal temperature of the electrodes. The chief condition for the maintenance of an arc is that the cathode has a high temperature and that the space surrounding it is conducting. If one of two carbon electrodes is hotter than the other, therefore, the current flows through the arc from the colder to the hotter electrode more easily than in the opposite direction, and the corresponding half waves of the alternating current are stronger for this reason. It is evident that this rectifying effect will be increased, if the temperature difference of the two electrodes is made as great as possible, as by cooling one electrode or establishing favorable cooling conditions. If an arc is produced between a carbon rod and a carbon plate, a direct current must flow through the arc from the rod to the plate. The rectifying effect of the arc increases with its length, and it would be expected that it might be lengthened to such an extent as to allow only the passage of those half waves of the alternating current flowing from the carbon plate to the rod. But if an attempt is made to approach this extreme condition, the arc becomes unsteady and breaks off. It is easy, however, to obtain a direct current equal to about one-seventh of the intensity of the entire current. In order to increase the temperature difference still more, he has produced an arc between a carbon rod and a rotating disc. The highest proportion of direct current obtained was thirty-one per cent of the total current consumed, which result is unfavorable. The efficiency might possibly be increased by providing for a better cooling of the disc or by carrying out the experiment in a vacuum. —*Abstracted and translated from Elektrotichnische Zeitschrift (Berlin), October* 1.

Explosion Gas Turbine or Combustion Gas Turbine.

The question which of these two types of turbine offers the greater practical possibilities seems important enough to deserve to be determined by calculation, says Dr. Phil. Wegner-Dallwitz in this article. Whenever reference is made to a gas turbine, it is usually a combustion turbine, although published calculations show that, with the technical means at present available for its construction, the practical possibilities of this engine are very poor, while an explosion turbine can already be constructed which, though its heat economy may not be brilliant, can compete with the steam turbine, particularly in view of its greater simplicity (absence of the steam boiler). In the present article the combustion turbine is dealt with. The operation of such an engine is briefly as follows: Air and gas of a pressure equal to about that of the atmosphere and also of about the same temperature are compressed by pumps to a higher pressure, with an eventual rise in temperature, and are pressed into a combustion chamber, where the gas is burned by aid of the air in such measure as it is delivered by the pump, but so that the pressure in the chamber is not changed by the combustion process and the resulting heat and expansion. The inflow of gas is offset by an equally great outflow. The combustion raises the temperature of the chamber contents and causes them to expand through Laval nozzles to a lower pressure and temperature, whereby they attain a certain velocity with which they flow into any desired turbine system and perform work. The practicability of the combustion gas turbine is largely dependent on the efficiency of the compressor. It seems that only a turbine compressor, which rotates on the same shaft as the gas turbine, can be considered. A compressor of this kind by Parsons has been reported, which is said to compress gases to 1.4 atmospheres with an efficiency of sixty per cent. But it is not indicated whether this figure refers to adiabatic or isothermal compression. In technical circles generally the statements concerning this high efficiency are regarded skeptically. But even assuming this high compressor efficiency to be possible, and taking into account the thermal efficiency of the combustion process, the author reaches the following conclusions: If we are limited to adiabatic compression, the thermal efficiency of the combustion gas turbine at low pressures will be extremely small, and even at the high combustion pressure of fifty atmospheres it will be only 3.4 per cent in spite of the high compressor efficiency. If it should become possible to approach the compression curve to that of the isothermal, then the efficiency will rise to utilizable values at the higher combustion pressures. With a pressure of ten atmospheres in the combustion chamber and isothermal compression the absolute efficiency will be twenty-one per cent. Such a turbine would, therefore, be capable of competing with other engines, that is, if the compression could be effected with an efficiency of sixty per cent. If we figure only with the Parsons compressor under the assumption that the efficiency of sixty per cent really refers to isothermal compression, a combustion turbine could be constructed that would work with a thermal efficiency of three to eight per cent. Such a turbine could not be put on the market.—*Abstracted and translated from Die Turbine (Berlin), September* 20.

INDUSTRIAL SECTION

ILLUSTRATED DESCRIPTIONS OF NEW AND STANDARD ELECTRICAL AND MECHANICAL APPARATUS

Lincoln Variable-Speed Motors.

Considerable success has been attained in shop as well as in electrical results in the last two years by the variable-speed motor of the armature-shifting type made by the Lincoln Motor Works Company, of Cleveland, Ohio, formerly the Lincoln Electric Manufacturing Company. This motor, when it was first put on the market, was described in the September 15, 1906, issue of this paper. Since then the motor has proved itself especially useful for the individual driving of machine tools throughout various machine shops in the United States and Canada. It is also used extensively in the machine shops of the United States Navy. The motor is conservatively rated, as the standard motor without undergoing any change meets the requirements of the United States Army and Navy.

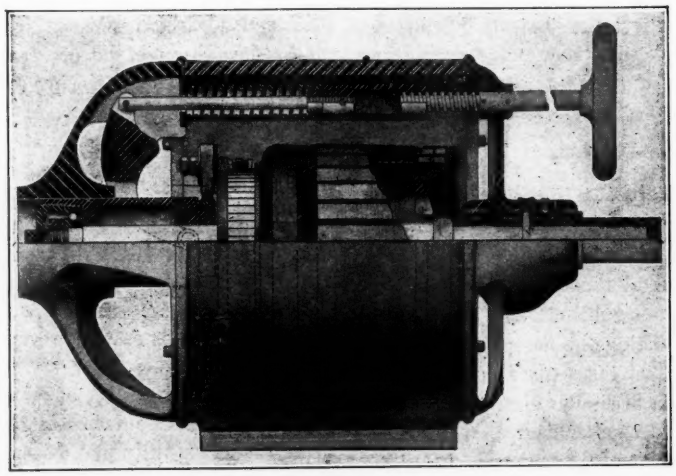
ARMATURE OF LINCOLN VARIABLE-SPEED MOTOR.

The accompanying cross-section shows the principal parts and working mechanism of the Lincoln variable-speed motors. It may be noted that by turning the hand wheel the slightly cone-shaped armature is withdrawn laterally away from the tapered field which at the same time gradually increases the air-gap, decreases the magnetic flux, and increases the speed.

Sparkless commutation is provided by the use of a commutating pole. The Hess-Bright bearing on the commutating end of the armature provides for both the radial bearing and end thrust due to the slight magnetic pull of the armature back toward the field. The pinion or pulley is carried on the sleeve which is the bearing and into which the armature shaft is keyed so the end movement occurs only in the armature shaft.

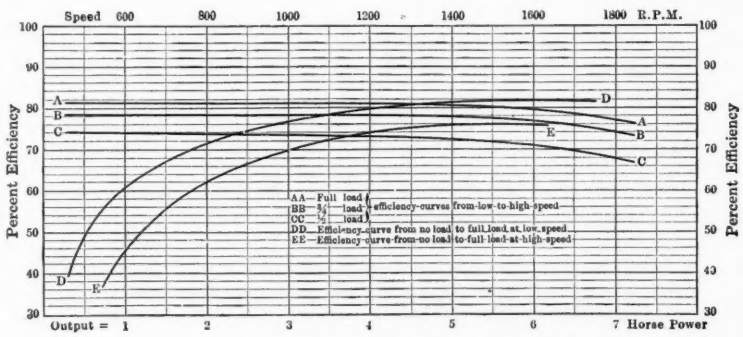
The principal features claimed for the Lincoln variable-speed motors are as follows:

No electrical controller is required. The speed variation is obtained by the simple mechanical device of shifting the armature. The motor is wired up and installed on a regular two-wire circuit in the same manner as any direct-current, shunt-wound, constant-speed motor. The motor is reversible and will run with like results in either direction. Ranges in speed as high as 1 to 10 are practicable. An infinite number of speeds can be obtained at will between the minimum and maximum speed limits of the motor, the speed change being smooth, continuous and gradual. The motor will develop its full rated capacity at all speeds, that is, with constant input the torque varies inversely as the speed, giving constant output. There is no decrease in capacity as the speed decreases. When set for any given speed the motor maintains a constant speed under varying load. In fact, the drop in speed from no load to full load at any speed is exceedingly small, comparing with the best constant-speed motor practice. By the use of special commutating poles, sparkless commutation is obtained to fifty per cent overload when running at any speed in either direction. By the use of steel frames and economical design, a light and compact motor is obtained for a given horse-power rating and efficiency.



SECTIONAL VIEW OF LINCOLN VARIABLE-SPEED MOTOR.

One of the special advantages of the Lincoln variable-speed motors which appeals to foremen and superintendents of machine shops is that if a machine tool is set for a certain speed and the operator stops the machine for calipering, on starting up again, he obtains his original cutting speed.

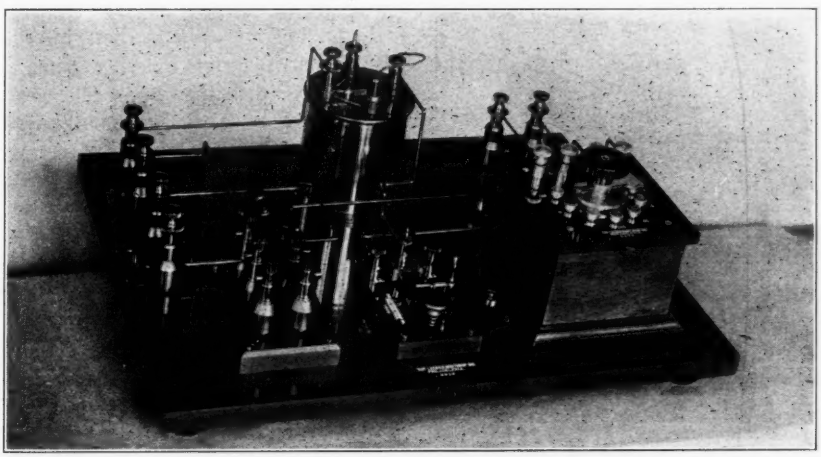

Speed 600 800 1000 1200 1400 1600 1800 R.P.M.
Percent Efficiency
100 90 80 70 60 50 40 30
A
B
C
D
E
AA—Full load efficiency-curves from low to high speed
BB—¾ load
CC—½ load
DD—Efficiency-curve from no load to full load at low speed
EE—Efficiency-curve from no load to full load at high speed
Output = 1 2 3 4 5 6 7 Horse Power

EFFICIENCY CURVE OF LINCOLN VARIABLE-SPEED MOTOR.

Factory Cable-Testing Apparatus.

The greater the experience of a manufacturer in insulation testing, the more will be the stress which he lays on the complete insulation of all parts of the equipment with which his product is measured. The touch of a damp hand at some critical point, a film of moisture on a hard-rubber surface, or a transient ground on a nearby lighting circuit, may introduce costly errors in the readings of the apparatus by which the quality of his product is gauged.

In maintenance tests, which must necessarily be performed in the field, portability is an absolute necessity in the testing apparatus, and, to a certain degree, the insulation of the various parts of that apparatus from each other and from ground must be sacrificed to secure this primal requisite. In factory measurements, where the testing apparatus is



Leeds & Northrup P-83 Testing Set.

permanently located, it is most distinctly advisable that no precaution be neglected which may guard against the effect of transient grounds, so dangerous because so intangible. It is best to mount the individual instruments of such a set so as to secure for them ample insulation, and then to make their connections entirely visible, and open to frequent inspection. This is best accomplished by running heavy copper wire through the air, making direct connections between the instruments.

The best practice to-day avoids corrugated posts and substitutes the petticoated type. Hard rubber under the action of light deteriorates, owing to the slow conversion of the sulphur in the rubber to sulphuric acid, producing a conducting film over the surface. The petticoated post not only increases the length of the insulating surface, without a corresponding increase in the height of the post, but has the further advantage that in it almost two-thirds of the insulating service is shielded from light, moisture and dirt.

The Leeds & Northrup Company, of Philadelphia, Pa., is making up to order testing outfits comprising high sensibility galvanometer, Ayrton shunt, tenth megohm resistance, standard condenser, and necessary switches and keys. These are mounted, as described and illustrated herewith, on a highly polished base of hard rubber, which is supported on rubber insulators. All connections are polished nickel plate, and contribute to the handsome appearance of the set.

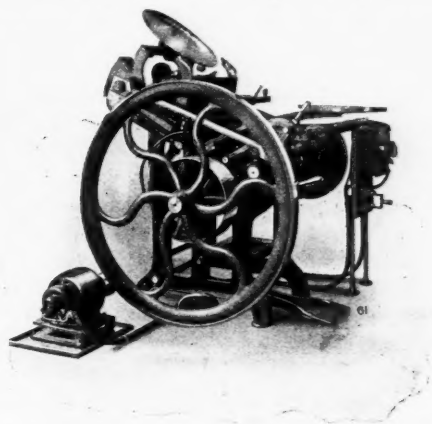
Friction Drive for Printing Presses.

The advantages of electric motor drive for printing presses have become so well known that it is unnecessary to comment upon them. At the present time there is hardly a printing plant of any size that is not driven by individual motors. Many of these, however, still use belts to connect the motors with the various presses.

There are certain classes of light machinery where belts are objectionable, owing to danger to the machine operators and the dirt which is necessarily thrown off. This is particularly the case in printing plants. Here it is very important that there shall be a minimum of dirt in the atmosphere. Compactness of the equipment is also important, as the presses must be capable of arrangement with special reference to light. In driving small printing presses a further objection arises. Presses are seldom run at a higher speed than 200 revolutions per minute, while the small size of motor required is usually built for speeds above 1,000 and even as high as 1,600. This would necessitate using a belt reduction of 5 to 1, or greater; or else a special low speed motor, with higher cost for the same power. When the motor is placed close to the driving wheel of the press, a

Motor Equipped with Spring Base for Friction Driving.

condition required in printing shops, unless a special motor is used this large reduction means driving a very large pulley from a very small one, which can not be done satisfactorily with belt drive, even with a belt-tightening idler. The idler itself is objectionable, owing to the power



Motor with Spring Base Applied to Printing Press.

which it wastes when made sufficiently tight to be effective.

For these reasons friction drive was adopted several years ago. This works satisfactorily as long as the friction wheel on the motor remains in contact with the driving wheel of the press, but requires considerable attention when the rigid form of motor base is used. Besides, the large flywheel on the standard makes of printing presses seldom runs true, which allows the motor to slip during part of each revolution of the flywheel. To overcome these objections the

Crocker-Wheeler Company, of Ampere, N. J., has devised the spring-base attachment shown in the accompanying illustrations. The motor is mounted on a base supported at one end with a hinge and at the other end by a heavy steel spring. An adjusting screw and locknut are provided so that the spring may be adjusted to any desired tension. The friction wheel of the motor is applied directly to the flywheel of the press. Any eccentricity of the flywheel is taken up by the spring in the motor base, so that the friction wheel makes positive contact throughout the whole revolution of the flywheel.

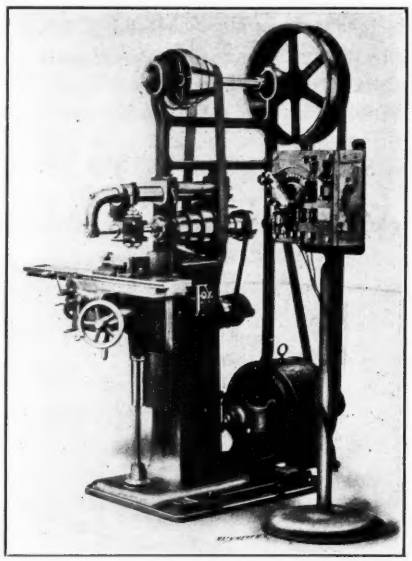
This arrangement permits the use of a high-speed motor, and therefore one of small size and low cost, and makes a very compact equipment. It enables the presses to be placed close together and very close to windows, a very important consideration. The switch and speed regulator are conveniently mounted on a stand or under the feeding shelf near the feeder's right hand, which puts the speed of the press under instant control. The absence of belts adds considerably to the cleanliness of the plant and removes the expense of furnishing new belts occasionally. There is also no belt tightening required, as the spring base, once adjusted, will take up the wear of the friction wheel almost indefinitely.

A large number of motors with spring-base attachments have been recently installed by the Crocker-Wheeler Company in printing plants and the demand for them has become so great that the bases are carried in stock for all of their form L motors from one-quarter-horse-power to two-horse-power. These motors have been on the market a number of years and have become celebrated for their high efficiency and low maintenance cost. They are carefully designed and contain the best of materials and workmanship. They are built in sizes ranging from one-twentieth to five horse-power are of the same rugged construction as the larger machines built by the same company.

Fox Milling Machine.

The simplicity of a machine designed for a wide range of speed is well shown in the accompanying illustration where the Fox light milling machine is shown fitted with a Westinghouse type "S" direct-current motor. The specifications under which this machine was manufactured required the speed of milling spindle to be adjustable over a range of 20 to 1, namely, from twenty-one to 425 revolutions per minute. Although but sixteen speeds were called for in these specifications, and these were obtained by using back gears and speed cones of four steps, it was decided to supply an adjustable speed motor.

This motor has a speed range of 2 to 1, that is, the speed may be varied from 660 to 1,320 revolutions per minute in fourteen steps. This permits of much finer



Fox Milling Machine.

adjustments in the speed of the spindle than would be possible with a constant-speed motor. This means that the cutter may at all times be run at the maximum speed it can stand, whatever the type of work it is performing.

The speed of the motor is controlled by means of field regulation, that is, the controller varies the resistance in the field circuit and the motor changes its speed accordingly. This controller is mounted on a pedestal that is independent of the motor, and may be moved somewhat and located at the most convenient point for the workman.

An interesting feature of the outfit is the method of mounting the motor on an extended sub-base which is pivoted at one side. The free end of the motor bracket is supported by the short arm of a foot lever which raises the motor and slackens the tension on the belt and allows the spindle of the machine to come to rest without waiting for the motor to stop. The motor is held in the raised position by a foot catch on the front lever. Depressing the catch allows the motor to settle and tightens the belt.

This outfit was supplied by the Fox Company to the United States Government for use at the Navy Yard at Charlestown, Mass. It is supplied with several special attachments which extend its range of work very largely, particularly adapting it for cutting small gears, milling squares, hexagons, etc., including taps and reamers, as well as a large variety of similar work.

This outfit represents the application of a motor to a standard belt-driven milling machine with a special modification of the base for mounting the motor, and shows how compact the complete outfit with a motor may be, even when the method of applying the power has not been altered. The convenience of electric drive is clearly shown, for the speed may be varied within the range of the motor by the movement of the controller handle, which the operator may locate wherever it will be most convenient to reach while at the tool.

A New Type of Conduit.

Beginning with the earliest introduction of a tube for carrying wires for electric wiring, the Sprague Electric Company, New York, has continued its efforts in the perfecting of interior conduit construction.

The latest improvement now introduced by the Sprague company is the single-strip type of conduit shown in the accompanying illustration. This differs from the well-known Greenfield double-strip type in that it is formed with a single strip of galvanized steel, interlocked and gasketed in such a manner as

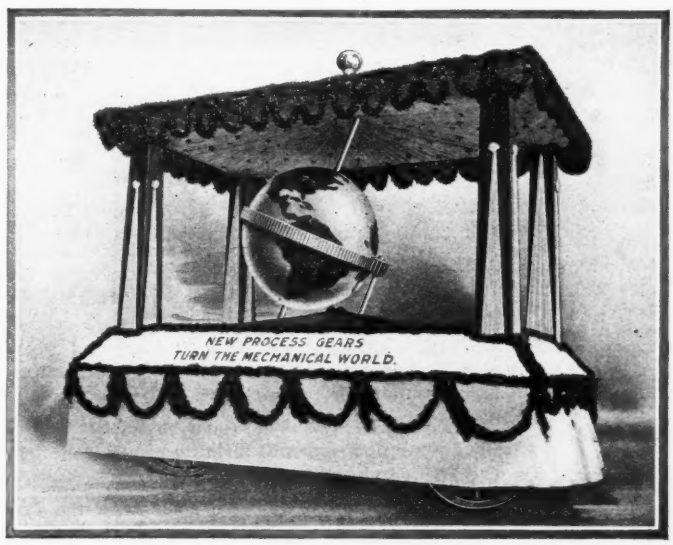
Sprague Single-Strip Conduit.

to be extremely serviceable in concrete construction as well as in locations liable to dampness.

This new single-strip type of flexible steel conduit is designed particularly for fireproof building construction, but is equally suitable for new non-fireproof work or for the wiring of existing buildings. The company also manufactures a full line of fittings for use with this new type of conduit.

A Prize-Winning Machinery Float.

The accompanying illustration shows a float entered by the New Process Rawhide Company, of Syracuse, N. Y., in the Commercial float parade of the Ka-Noo-No Karnival, which is held annually in Syracuse in connection with the New York State Fair. This float won first prize in the machinery division as "the best appointed and most symbolic." The globe was supported on an upright shaft passing through the centre, and having a bearing at the top and bottom. The globe proper was about five feet in diameter, and was made of one-ply rawhide formed in two hemispheres which were attached to a large gear ring at the centre. Inside the globe there were thirty incandescent lamps, and as New Process rawhide is quite translucent, the night effect was striking. The pinion was of rawhide carried on an upright shaft with a bearing at the bottom. This pinion was rotated by chain drive under the wagon from one of the rear wheels, and imparted motion to the globe when the wagon was moved.



A Prize-Winning Machinery Float.

Electrical Supplies for the Navy Department.

The Bureau of Supplies and Accounts will open bids in Washington, D. C., on November 10 for the following electrical material: Two cabinets and panel-boards, 1,800 feet cable and 4,000 feet rubber-covered wire for delivery at Norfolk, Va.; miscellaneous cable and cable conductors, for delivery at Philadelphia, Pa.; fifty-six grammes of sheet platinum and 585 grammes of platinum wire for delivery at Brooklyn, N. Y.

Electrical Friction Tapes.

In the manufacture of insulating tapes and cloths, the Massachusetts Chemical Company, of Walpole, Mass., has year by year studied the needs of the electrical art, in the development of insulations for all kinds of electrical apparatus under all conditions of operation. Scientific research has steadily kept pace with the exacting requirements of the electrical industries.

The essentials of a first-class modern friction tape, that give it the necessary electrical and mechanical qualifications, are: Lasting quality, chemical neutrality, adhesiveness and moisture-proof quality.

First is the durability of the tape in service—its "lasting quality." It must not only have good initial adhesiveness, but must be free from all risk of drying out under the severe and repeated temperature changes to which it will be subjected, or under atmospheric conditions. When used to insulate joints in line conductors, exposure to alternating extreme heat and cold, and rain and dry weather, winds, acids or alkaline vapors, and varying mechanical strain, must not cause it to unwind, or otherwise affect the continuity and insulation of the protecting envelope that it provides. When used in the insulation of electrical machinery the heating that it gets, buried as it may be in the vitals of the windings where it is subjected for long periods to the maximum temperature attained by the machine in operation, must not deteriorate or "age" it in any way—as by partially carbonizing it—as to lower the insulation which it is depended on to give.

The material of the tape must be perfectly neutral; it must contain nothing that will attack the fabric or the impregnating insulation, or that will undergo chemical decomposition into such corroding substances. This quality is shown in practice by a test of the mechanical strength of the material, made several months after impregnating and coating it with the compound—a tape perfect in this respect showing no loss of strength after such lapse of time. Neither must there be present any substances that can corrode or deteriorate the copper over which the tape is wound.

Adhesiveness is an important feature. The experienced and discerning buyer, in deciding upon a tape that will give genuine and permanent protection to wire joints, and in all uses in the construction of electrical apparatus, looks further than to initial adhesiveness.

Moisture-proof quality is a feature that is specially required in tapes used in connection with the winding of electrical machinery. Owing to the fact that cotton absorbs moisture very readily, tapes to resist moisture must be thoroughly impregnated with the compound, and the latter must be of good quality.

The Massachusetts Chemical Company has recently begun the construction of a new addition to the Walpole factory. This extension, comprising 15,000 square feet of floor space, will be used in connection with the tape department, which has outgrown its present accommodations.

Hudson Tunnels Progress.

William McAdoo, president of the Hudson tunnel system in New York and New Jersey, announced recently that the entire work of construction was nearing completion, and that trains would be running under the river on all lines early next summer.

The tube between Hoboken and Christopher street has been open for several months. The down-town tubes have been completed, save for a small piece of excavation beneath the piers on the New York side, and a small section in the Lackawanna freight yards.

A force of 3,000 men is employed on the work of excavation.

Milwaukee Council Votes for Municipal Light Plant.

The municipal council of Milwaukee, Wis., on October 13, voted to direct the board of public works to build an electric light plant capable of furnishing current for 1,000 arc lamps of 2,000 candle-power each.

Current Electrical News

DOMESTIC AND EXPORT.

NORTHERN CALIFORNIA POWER COMPANY—An issue of $10,000,000 of bonds is contemplated by the Northern California Power Company, Consolidated, to retire the present bonded indebtedness of various subsidiary companies and provide funds for extension. These include the Northern California Power Company, which has a capital stock of $10,000,000. The shareholders meet on November 11 to vote the bonded indebtedness.

NEW POWER COMPANY—The Popo Agie Power, Fuel and Oil Company, capital stock $1,000,000, has filed articles of incorporation and proposes to construct a large power plant near Lander, Wyo., and generate power through the burning of crude oil. This company will be a rival of the Big Horn Power Company, which is building a plant to generate 10,000 electrical horse-power from the flow of the Big Horn River at a point near where the oil-power plant will be located.

CANADIAN PACIFIC RAILWAY ELECTRIC PLANS—Sir Thomas Shaughnessy, president of the Canadian Pacific Railway, says that the company has spent $10,000,000 double-tracking the line between Winnipeg and Thunder Bay in the last year. It will now start on similar work through to the coast, for which $50,000,000 of new stock was voted recently. The company is preparing to operate trains over the mountains for 700 miles by electricity generated by water power.

MEXICAN ELECTRICAL NOTES—The work of installing the underground system of the Telefonos Comerciales of Morelia, Mexico, a corporation made up of local business men, has been completed. The work has been under the direction of the Siemens-Schuckert Werke and cost $40,000. The legislature and the state government of Puebla have conceded a concession to the Cia. Hidro-Electrica de San Agustin, exempting it from all state and municipal taxes for a period of twenty-five years.

WASHINGTON WATER POWER COMPANY LETS CONTRACTS—The Washington Water Power Company, of Spokane, Wash., has awarded a contract to the I. P. Morris Company, of Philadelphia, for the installation of four water-wheels, each weighing 650,000 pounds, and each having a capacity of 9,000 horse-power, with a head of sixty-eight feet. The plant will be located on the Spokane River, fifteen miles west of Spokane, to furnish electric light and power for towns in the vicinity.

MINNESOTA & ONTARIO POWER COMPANY—The Minnesota & Ontario Power Company has been incorporated with a capitalization of $7,000,000. The corporation plans to develop idle water power, establish a paper-manufacturing centre and conduct lumbering operations over a territory of 150,000 square miles. The board of directors is as follows: Edward W. Backus, William E. Brooks, Warren Curtis, John A. Davis, of New York; W. A. S. Peabody, Alexander Smith, of Chicago, and Warren Curtis, Jr., formerly of Corinth, N. Y.

LIGHT COMPANY MORTGAGED—A chattel mortgage for $5,000,000 has been filed at Wapakoneta, Ohio, given by the Indiana Lighting Company, incorporated under the laws of Indiana, to the Central Trust Company, of New York, on all its property in Indiana and Ohio. The mortgage is given to secure a fifty-year four per cent gold bond issue. In addition to all its machinery, pipe lines, gas wells, etc., in various counties, the mortgage covers artificial and natural-gas plants, electric light and power plants in the following cities and towns: Greenville, Ansonia, Lima, Celina, Wapakoneta and St. Mary's, in Ohio, and Ft. Wayne, Lafayette, West Lafayette, Logansport, Peru, Wabash, Frankfort, Lebanon, Bluffton, Montpelier, Geneva and Anderson, in Indiana.

EXTENSIVE SOUTHERN POWER DEVELOPMENT PLANNED—D. G. Zeigler, a consulting engineer and architect, of Atlanta, Ga., has made an inspection of the Suwanee Falls, a few miles above White Springs, Fla., on the Suwanee River, with a view to developing the power at that place. It is said that a large company has purchased the falls and will begin at once the work of development. The falls have a capacity of about 90,000 horse-power in good seasons and a minimum capacity of 30,000 horse-power when the river is high. The concern has a capital of $3,000,000. Blue prints have been made of the territory within seventy-five miles of the falls, extending nearly to Douglas on the north, Thomasville on the west, and taking in Palatka on the south, Jacksonville and Fernandina on the east. It is said that interurban electric lines are to be established between the towns within this circle. One of the lines will go from Valdosta toward Quitman and Boston on the west, to Waycross on the east, thence toward Fernandina and Jacksonville. Another line will go from Valdosta to Jasper and on toward Live Oak, Lake City and other Florida points. Several lines will run out from Jacksonville, Lake City and other large towns in the circle. The territory to be reached in this way embraces over half a million people. It is understood to be the purpose of the company to also furnish power and lights for the various towns. It is said that the power can be developed for about $35 per horse-power per annum.

ELECTRIC LIGHTING.

GUERNSEY, OHIO—Frank C. Smith has applied for a twenty-five-year lighting franchise to light the town of Byesville.

ANDERSON, CAL.—The citizens of Anderson are arranging to have the village electrically lighted by the Northern California Power Company.

CONROE, TEX.—The electric light plant has recently changed hands, F. K. Nance having sold the plant to Lee Oualline, of Keenan, Tex., who has already taken charge.

CENTRAL CITY, COL.—It is announced that the Hampton Consolidated Mines Company will install a complete electrical plant for the thorough development of the property.

CHATHAM, N. J.—A contract made with the Commonwealth Water and Light Company, of Summit, for a supply of electric current during the daytime has been accepted by the borough council.

CODY, WYO.—The Reclamation Department has decided to install an electric plant at the Corbett dam of the Shoshone reclamation project and to supply electricity at cost to the settlers under the project.

CORONADO, CAL.—The board of trustees has signed a five-year lighting contract with the Coronado Beach Company for fifty sixty-candle-power lamps, the town to pay $87.50 per month for the service.

DELAWARE, OHIO—The Delaware Electric Light and Heating Company has been awarded the contract for lighting the city for the next ten years. The cost of each arc light will be $75 and there are 148 in the city.

BURLINGAME, CAL.—The city council has entered into a contract with the United Gas and Electric Company whereby the company will furnish the municipality with twenty-six arc lights during the coming year for $56.50 each.

BAY CITY, TEX.—A. L. Strong, of New York, has purchased an interest in the electric light and ice plant and will put about $30,000 into the company. The capacity of the ice plant will be increased to forty-five tons daily and a larger generator installed.

WATERLOO, IOWA—The city council at Waverly, where the electric light and water plants were burned recently, has decided to submit to the electors a proposition to issue $30,000 in bonds for the erection of new plants. As the council is limited by law in the

expenditure of funds to one and one-fourth per cent of the actual value of the property, a special election must be called to authorize its action.

BURLINGTON, WIS.—The contract for street lighting for five years has been let to the Burlington Electric Light and Power Company. Ten 1,200-candle-power arc lights at $65 each a year and ninety eighty-candle-power incandescents at $27 a year will be used.

ST. LOUIS, MO.—The Glasgow estate is contemplating the construction of a waterworks and electric light plant to supply the 600 acres on the hill to the west of the present city waterworks reservation, and the subdivision of the property for suburban homes.

OSWEGO, N. Y.—Edwin L. Huntington, of Mexico, has sold the electric lighting plant at that place to the Mexico Lighting Company for $15,000. The lighting company has executed a mortgage on its property for $10,000 to Charles A. Peck as trustee.

MINNEAPOLIS, MINN.—The Minneapolis General Electric Company will increase its distributing capacity a fourth in the residence and business districts of Minneapolis. This announcement is made by A. W. Leonard, manager. Additional feeders will be put in.

ATLANTA, GA.—On the application of the Knickerbocker Trust Company, of New York, the Gainesville Electric Railway Company has been placed in the hands of a receiver by Judge Newman, of the United States Court here. Samuel C. Dunlap, of Gainesville, was named receiver and his bond was fixed at $10,000.

SPARTANSBURG, S. C.—F. H. Knox, vice-president and general manager of the Electric Manufacturing and Power Company, which concern owns the power plant at Gaston Shoals, on Broad River, states that the company is figuring on building another power plant either on Broad River or at Nesbitt Shoals, on Tyger River.

HUNTINGTON, L. I.—The Huntington Light and Power Company, the stock of which is held principally by Brooklyn and Manhattan men, who are summer residents here, has decided to more than double the capacity of the plant at Halesite. This is made necessary by the constantly increasing business of the company.

FARRAGUT, IOWA—A company has been formed by Farragut citizens, with J. J. Whisler at the head, to be known as the Farragut Light and Power Company, and this company will take over the franchise secured by J. A. Masters and J. J. Whisler. The contract provides for forty street lights at a minimum price of $300 per year.

WAYCROSS, GA.—J. E. Wadley, president of the Waycross Electric Light and Power Company, has offered the entire electric light plant, with present contracts, to the city of Waycross for $50,000. If no inclination is shown on the part of the city to purchase the plant, Mr. Wadley will have it enlarged considerably and improved throughout.

LA CROSSE, WIS.—Preliminary steps are being taken in order to determine the advisability of establishing a municipal lighting plant in this city. The plant will cost about $40,000 and will be used to serve only the city buildings and the streets. Application will be made to the state railroad commission to ascertain whether permission will be granted to erect the plant.

DAYTON, OHIO—F. M. Tait, general manager of the Dayton Lighting Company, has closed a deal for the purchase of the Middletown Electric Lighting Company's plant. The purchase price, it is understood, is $100,000. Associated in the deal are Albert Emanuel and L. A. Coppock, of this city. The Middletown plant needs repairs and the company expects to spend about $50,000 for this purpose.

BATAVIA, N. Y.—Judge Hazel, of the United States District Court, at Buffalo, has appointed Marc W. Comstock, a Buffalo lawyer, as receiver for the Genesee County Electric Light, Power and Gas Company. The company has been in business but a few months and distributes Niagara power in Batavia, Oakfield, Akron and Clarence, obtaining its power from the Niagara & Lockport company.

NEWBURGH, N. Y.—The Public Service Commission, Second District, has consented to the lease by the Electric Light Company of New Paltz to the Newburgh Light, Heat and Power Company of the right to use, so far as it may be practicable, for a term of ten years, part of its electric pole system in the village of New Paltz, and to string and erect thereon a high-tension transmission line.

AUGUSTA, GA.—Incorporation of the Georgia Power Company, of Gainesville, is announced. The concern has been formed with a capital stock of $500,000 to develop water-power properties and build electric plants for distribution of power among manufacturing plants and also to promote cotton-mill building in this territory. Jack J. Spaulding, H. G. Pryor and James A. Rudolph are the incorporators.

GRIDLEY, TENN.—The village board of trustees has entered into contract with two citizens, Messrs. Miller and Kirk, for arc lights to illuminate the business section of the town. There are to be sixteen arcs in all. Miller and Kirk agree to supply the sixteen arcs for $83.33 per month. Work on the plant is to be started at once, and it is hoped to have the system in operation by February 1.

BRISTOL, TENN.—Judge S. K. J. Kirkpatrick, J. Frank Toney, W. S. Erwin and W. T. Tucker and others have made application for a charter for the Southern Electric and Power Company, which proposes to do business at Erwin, Unicoi County, using the water power of the Chuckey River. The purpose of the company is to light the town of Erwin by electricity and to eventually furnish power for power purposes.

LUCEDALE, MISS.—At a recent meeting the Lucedale Light and Power Company was organized with the following officers and directors: Dr. W. D. Ratliff, president; C. N. Buffum, vice-president; P. J. Goodman, secretary and treasurer; Dr. W. D. Ratliff, C. N. Buffum, T. A. Banks, G. M. Luce, F. M. Young, Dr. J. A. Dorsett and T. R. James, directors. Work on the installation of an electric light plant has been started.

STOYESTOWN, PA.—Stoyestown and Sprucetown will be lighted this winter by electricity, according to the men at the head of a new light company recently formed and granted a franchise. A plant will be located between the two towns and work on its construction will be started soon. The poles are being planted along the principal streets of the town. The officers of the company are as follows: President, Daniel Long; secretary, Valentine Muller; treasurer, Earl Fulton.

DANVILLE, IND.—The Danville Light, Heat and Power Company has purchased ground along the Big Four Railroad, on the south edge of Danville, and will at once begin the erection of a new and much larger power plant. The building will be of steel, brick and cement and will be 50 by 114 feet. The new plant will furnish a twenty-four-hour service, and in addition to lighting Danville, will also furnish the current for Plainfield and Brownsburg and to farmers along the line.

PINE BLUFF, ARK.—A deed has been filed transferring all of the property of the old Pine Bluff Light and Water Company to the Pine Bluff Corporation. The property was recently publicly sold to satisfy judgment in Federal Court. The purchase price was $450,000. Mortgages signed by the Pine Bluff Corporation to the New York Trust Company for $750,000 were also placed on record. The proceeds of this transaction will be used in rebuilding the gas, water and electric plants to be operated by the company.

SCRANTON, PA.—George N. Tidd, general manager of the Lackawanna Valley Electric Light and Power Supply Company, of this city, which was recently taken over by the American Gas and Electric Company, makes the announcement that the latter concern has made an appropriation of $200,000 to be expended on the local plant. It is proposed to change the service from 1,200 to 2,300 volts. The transformers will be renewed and the plant given a thorough overhauling. A transmission line from Scranton to Carbondale will be erected.

DENVER, COL.—Electrical power for mines and mills in Clear Creek County will be furnished by the Continental Mines, Power and Reduction Company, which has just completed a hydroelectric water and power transmission plant at Yankee. Water power is secured by impounding the waters of River Fall River, Cumberland and Silver creeks. The three streams are united and carried by means of an 8,000-foot flume to a fore-bay and penstock. From the penstock to the power-house there is a fall of 550 feet. George H. Sethman is consulting engineer of the power company.

ELECTRIC RAILWAYS.

BERKELEY, CAL.—The town board has granted the Key Route Company a forty-eight-year electric railway franchise.

BALTIMORE, MD.—R. W. Beall, of the real estate firm of Moore & Hill, is behind a project for the building of another electric line between Baltimore and Washington, D. C.

IOWA CITY, IOWA—Iowa City voters will pass upon the granting of a franchise for the construction and operation of a street-car system in Iowa City at the general election November 3.

SHERMAN, TEX.—Citizens of Sulphur, Okla., have begun active work to build a road from there to Sherman. The line will connect with the electric interurbans running to Oklahoma City, Dallas and Fort Worth.

OMAHA, NEB.—At a meeting of the Independent Transportation Company, of this city, it was decided to abandon the proposition to establish an automobile bus line, and instead to plan for a track railway with gasolene motors or electric cars.

CLEVELAND, OHIO—The Municipal Traction Company has awarded a contract to the Cincinnati Car Company for the changing of fifty old-style cars to pay-as-you-enter cars. Side seats will be replaced by cross seats, with centre aisles.

WACO, TEX.—It is announced that a bonus of $100,000, right of way and franchises in Waco, Temple and Marlin, will be given the parties who will build the interurban connecting these towns. The offer was decided on at a joint conference here.

SYRACUSE, N. Y.—Work has been started on the final survey of the extension of the Rochester, Syracuse & Eastern electric road from Port Byron to this city, and it is expected that building operations on the road will be commenced the first of the year.

TRENTON, N. J.—Chancellor Pitney has continued the receivership of the Camden & Trenton Railway Company, with Wilbur F. Sadler as receiver, until December 29, that the bondholders' committee may confer further, looking toward a reorganization of the company.

BUFFALO, N. Y.—The Pinckerton Construction Company, of Philadelphia, has been awarded a contract for completing an important link of the trolley system of the Buffalo Southern Railway, from the Seneca street city line. The contract covers a six-mile stretch from the city line.

SNOHOMISH, WASH.—Application has been made to the city council for a street-car franchise for the operating of an electric system of railways in the city. The application was made by J. M. Shawhan, formerly chief clerk of the Oregon Railway and Navigation Company, and J. D. Brown.

EDGEFIELD, S. C.—The incorporators of the Augusta & Edgefield Electric Railway have awarded the contract to survey the line to Jones, Requarth & Kelsey, of Charleston. The survey will cover two routes, one from Augusta to Newberry, *via* Edgefield and Saluda; the other from Augusta to this place and to Greenwood.

SPRINGFIELD, ILL.—Officials of the Illinois Traction System announce that the right-of-way for the proposed Saline county line connecting Carrier's Mills with Eldorado and incidentally a step in the direction of the proposed Cairo-East St. Louis line has been secured and that operations on that road will be inaugurated at once. A franchise to operate cars through Eldorado has been granted.

SPIRIT LAKE, IOWA—At a meeting of Spirit Lake aldermen and citizens, presided over by A. B. Funk, it was voted that the Sioux City-Spirit Lake interurban line be granted a franchise on the streets of that city, together with an electric light franchise and the use of a ten-acre tract of land for the location of a powerhouse and terminals.

HARRISBURG, PA.—Governor Stuart approved an application for the extension of the route of the Cumberland Railway Company, which was granted a charter recently, to operate in Middlesex Township, Cumberland County. The extension covers thirteen miles of Carlisle streets and the various townships in that vicinity. W. E. Glatfelter, of Balfour, is the president.

JEANNETTE, PA.—The contract for grading and building the Jeannette, West Newton & Monongahela Valley Street Railway has been awarded to the A. W. Sperry Company, of Connecticut. Engineers are at work setting the grade stakes and the contractor will follow with a large force of men grading and building the road. The intention at present is to build the road from Jeannette to West Newton and later to the Monongahela Valley.

WASHINGTON, D. C.—The Washington, Alexandria & Falls Church Electric Railway has placed on record a mortgage on all of its property to secure an issue of $1,000,000 in bonds. The Girard Trust Company, of Philadelphia, is trustee under the mortgage, the object of which is to pay off two previous mortgages aggregating $350,000 and to devote the remainder to repairs and purchase of new equipment. The company was recently relieved of receivership.

SAN RAFAEL, CAL.—At a meeting of the board of supervisors Charles Murphy, a San Francisco capitalist, made application for an electric railroad franchise to include practically all the towns of Southern Marin. He plans to run one trolley line from Sausalito to Mill Valley, another from Mill Valley junction across the marshes to Belvedere and Tiburon and a third from Alto station to Corte Madera, Larkspur, Kentfield, Ross, San Anselmo and San Rafael.

PITTSBURG, PA.—A new traction system is proposed here to connect with the Pittsburg Railways Company and traverse portions of the suburbs. The Carnegie & Castle Shannon Railway Company, Banksville & West End Traction Company and the Liberty & West Liberty Traction Company are being formed to develop sections south of the Ohio and Monongahela rivers. They have applied for permission to construct lines on the new country roads to the several towns indicated in the names of the companies.

DOYLESTOWN, PA.—It is said that the Philadelphia Rapid Transit Company has acquired control of the Philadelphia & Easton Electric Company, which runs a trolley line, thirty-six miles long, from here to Easton, which cost more than a million dollars to build. This will give a continuous line from Philadelphia to Easton under one management. It is also reported that the company operating the trolley line from here to Bristol will furnish a certain amount of money to build the Doylestown-Perkasie trolley, provided a certain sum is subscribed by those interested along the line.

TAYLORVILLE, ILL.—A contract has been let by the Taylorville Light and Heat Company for the construction of the street railway track and overhead equipment to the Chicago Installation Company for $61,800. The track is to be four miles and 100 feet long and will extend from the extreme northeast end to the extreme southeast part of Taylorville. The company also purchased forty acres of land from L. D. Hewitt at the southwest terminus of the track for the purpose of laying out a city park. The powerhouse is now under course of construction. The company is capitalized at $150,000.

MOLINE, ILL.—Engineer W. H. Kimball has made his report to the stockholders of the proposed Davenport and Manchester interurban road of the result of the preliminary survey. The report shows that the Manchester line will be 94.9 miles, exclusive of sidetracks and one or two branches that were merely investigated. The cost will be $1,242,610, exclusive of railroad crossings, sidetracks and depots. The cost of fencing in the right of way will be $30,800 additional. George T. Baker, who has been president, has resigned and the road is at present under the direction of J. A. Voorhees, vice-president. F. W. Rank, of this city, is secretary.

COOPERSTOWN, N. Y.—The Oneonta & Mohawk Valley Railroad, an electric line connecting Herkimer and Oneonta, has been sold by auction to Joseph A. Starrett, New York. The sale was made under mortgage foreclosure brought by the Knickerbocker Trust Company, of New York. Mr. Starrett was the only person present who qualified to bid, and his first offer of $200,000, the minimum figure set by the order of the court, was accepted by the referee. The sale was made subject to receivers' certificates and other obligations amounting to over $300,000. It is reported on good authority that the purchase was made for Herbert T. Jennings, who as promoter constructed the road.

PERSONAL MENTION.

MR. CLEMENT C. SMITH, of Milwaukee, Wis., has been elected president of the Wisconsin Electric Company to succeed O. C. Fuller.

MR. BERTRAM M. DOWNS has been elected vice-president of the Brookfield Glass Company, with headquarters in the United States Express Building, New York city.

MR. F. V. L. SMITH, who has been in charge of the Sprague Electric Company's office in New Orleans, La., since its establishment, has opened a branch office for the company in Atlanta, Ga. Mr. Smith will be in charge of both offices.

MR. J. M. BAKER, for several years district manager for the New England Telephone and Telegraph Company at Lynn, Mass., has been promoted to the office of district plant chief, with headquarters at Salem. Fred A. Phillips has been placed in charge of the Lynn office.

MR. MATTHEW A. SAMMETT has severed his connection with the Montreal Light, Heat and Power Company as engineer in charge of tests and design, and will hereafter devote his entire time to consulting engineering work, with headquarters in the Canadian Express Building, Montreal, Canada. Mr. Sammett has had a wide experience in the electrical field, having been connected for a long time with the General Electric Company and a number of other companies.

LORD NORTHCLIFFE (Alfred Harmsworth), the celebrated English publisher, and Lady Northcliffe spent some time last week inspecting the power developments at Niagara Falls. On the morning of October 21 Lord and Lady Northcliffe visited the plant of the Ontario Power Company, on the Canadian side. After inspecting the plant Lord Northcliffe declared that the transmission of electric power to such great distances was a wonderful thing, and expressed his belief that in time that section of the country would be one of the greatest manufacturing centres of the world. Lord Northcliffe had not visited Niagara Falls in fifteen years and was greatly impressed with the growth of the city since his earlier observation.

OBITUARY NOTE.

COLONEL W. W. RIDER, of Allentown, Pa., during the past two years traffic manager of the Consolidated Telephone Companies of Pennsylvania, died on October 24 from typhoid fever at St. Luke's Hospital, South Bethlehem, Pa., aged fifty-eight years. He was connected with the telephone business many years.

NEW INCORPORATIONS.

YONKERS, N. Y.—Westchester County Automatic Telephone Company. $100,000.

HARRISBURG, PA.—Macungie Electric Light, Heat and Power Company, of Macungie. $5,000.

DENVER, COL.—Telluride Power Company. Capital increased from $2,500,000 to $10,000,000.

BOSTON, MASS.—Rock Hill Telephone Company, Boston. To carry on a telephone and telegraph business. $50,000. President, S. R. Smith; treasurer, P. Workman, Rock Hill, S. C.

ALBANY, N. Y.—Summit Telephone Company, of Schoharie County. $2,500. Directors: George Skidmore, Eli Baker, Alvin Joslin, C. F. Wharton, Frank Cox, of Summit, and Myron Grey, of Fulton.

LITTLE ROCK, ARK.—Eldorado Telephone Company. $50,000, all of which is subscribed. Incorporators: P. C. Blain, president; W. P. Ritchie, B. Arrett, T. F. Gaughan, B. C. Powell and H. S. Powell.

RICHMOND, VA.—Craig Water Power Company, Roanoke. To generate power for use in Roanoke. $5,000 to $200,000. A. L. Sibert, president; L. A. Scholz, vice-president; Henry Scholz, secretary and treasurer, all of Roanoke, Va.

ALBANY, N. Y.—Dwaas Electric Company. $20,000. Directors: Edward E. Sabourin, Sandy Hill; George Gifford, Schenectady; Harold J. Werner, Mechanicsville; Adam Rathgeber, New York city; Andrew T. G. Wemple, Schenectady, and Alfred Stoodley, Schenectady.

ELECTRICAL SECURITIES.

The market last week, while not displaying any very pronounced upward tendency, gave unmistakable evidence of the soundness of underlying conditions. The presidential election is still an important factor in the situation, but from the present indications it would appear that a considerable betterment in business generally is to be hoped for. The iron and steel trade shows some improvement, although, as elsewhere, a hesitating pre-election tone tends to curtail betterment.

Dividends have been declared upon the following electrical securities: Electrical Securities Company; semi-annual dividend of 2½ per cent, payable November 2. Montreal Street Railway Company; quarterly dividend of 2½ per cent, payable November 2. Butte Electric and Power Company; quarterly dividend of 1¼ per cent, payable November 2. American District Telegraph Company of New York; regular quarterly dividend of 1 per cent, payable November 15 to stock of record November 1. Ohio Traction Company; regular quarterly dividend of 1¼ per cent on the preferred stock, payable November 2. Montreal Light, Heat and Power Company; regular quarterly dividend of 1½ per cent, payable November 16.

ELECTRICAL SECURITIES FOR THE WEEK ENDED OCTOBER 24.

New York:	*Closing.*
Allis-Chalmers common	11¼
Allis-Chalmers preferred	35½
Brooklyn Rapid Transit	49¼
Consolidated Gas	144
General Electric	140
Interborough-Metropolitan common	10
Interborough-Metropolitan preferred	29⅛
Kings County Electric	125
Mackay Companies (Postal Telegraph and Cables) common	79½
Mackay Companies (Postal Telegraph and Cables) preferred	69
Manhattan Elevated	136
Metropolitan Street Railway	24
New York & New Jersey Telephone	114
Western Union	60¼
Westinghouse Manufacturing Company	81

At a meeting of the board of directors of the Western Union Telegraph Company all of the present officers and members of the executive committee were re-elected.

Boston:	*Closing.*
American Telephone and Telegraph	127
Edison Electric Illuminating	230
Massachusetts Electric	50
New England Telephone	120
Western Telephone and Telegraph preferred	70

Philadelphia:	*Closing.*
Electric Company of America	9¾
Electric Storage Battery common	36
Electric Storage Battery preferred	36
Philadelphia Electric	11
Philadelphia Rapid Transit	22⅝
United Gas Improvement	87¼

Chicago:	*Closing.*
Chicago Telephone	124
Commonwealth Edison	108¼
Metropolitan Elevated preferred	—
National Carbon common	68
National Carbon preferred	110

DATES AHEAD.

American Electrochemical Society. Fall meeting, New York city, October 30-31.

Association of Car-Lighting Engineers. First annual meeting, Chicago, Ill., November 18.

National Society for the Promotion of Industrial Education. Annual meeting, Atlanta, Ga., November 19-21.

International Independent Telephone Association. Annual convention, Chicago, Ill., December 1-3.

American Society of Mechanical Engineers. Annual meeting, New York city, December 1-4.

American Roentgen Ray Society. Annual meeting, New York city, December 28-30.

Chicago Electrical Show. Coliseum, Chicago, Ill., January 16-30, 1909.

American Association for the Advancement of Science. Annual meeting, Baltimore, Md., January, 1909.

Northwestern Electrical Association. Annual meeting, Milwaukee, Wis., January, 1909.

TELEPHONE AND TELEGRAPH.

HAMILTON, ONTARIO—The city council has granted a new franchise to the Bell Telephone Company.

WICHITA, KAN.—A new $12,000 multiple switchboard is being installed in the offices of the Independent Telephone Company.

MINNEAPOLIS, MINN.—The Rolling Stone Telephone Company will conduct a rural telephone system in the vicinity of Rolling Stone with a capital stock of $10,000.

INDIANAPOLIS, IND.—An underground telephone system is to be placed at Fort Benjamin Harrison which will cost between $12,000 and $15,000. Work has been commenced.

CHARLESTON, W. VA.—The Charleston Home Telephone Company will install during the next year 50,000 feet of new cable, which will accommodate 1,000 additional subscribers.

GAFFNEY, S. C.—A corps of telephone men is at work building a telephone line from Gaffney to Pacolet, a distance of about eighteen miles. About twenty telephones will be installed along the route.

DUBUQUE, IOWA—At a meeting of the directors of the Interstate Telephone Company and the local Bell company, held in Dyersville, a contract for toll connections between the two companies was signed.

SAN BERNARDINO, CAL.—The city councilmen have notified the Home Telephone Company that work on the underground system must be commenced within sixty days and completed within six months from date.

LEESVILLE, TEX.—Business men of Leesville and farmers on the route are building a rural route telephone from this place to Union, Wilson County, connecting with the one running through that county; also from there to Nixon and Dewville.

LA CROSSE, WIS.—The Wisconsin (Bell) Telephone Company has absorbed the Western Wisconsin Telephone Company, which has 1,500 subscribers and exchanges in Galesville, Arcadia, Trempealeau, Fountain City, Blair, Ettrick, Whitehall and Independence.

ELDORA, IOWA—The contract for the erection of a building for the Eldora telephone exchange has been let to F. X. White, of Eldora, whose bid was $4,760. The erection of the building is to be begun immediately, and it is to be ready for occupancy by January 1.

SIOUX FALLS, S. D.—Under an order from Judge Carland, of the United States Court, the property of the Citizens' Telephone Company, of Sioux Falls, has been sold to the New State Telephone Company, of Iowa. The purchasers say the local system will be maintained as an independent company. The New State company bid in the property at $94,700. The bidding started at $50,000.

MAHANOY CITY, PA.—In order to improve its telephone system throughout the lower western sections of Schuylkill County, the officials of the American Union Telephone Company are building new lines. During the ensuing two months there will be about seventy-five miles of additional wire strung. The first extension consists of a line from the central station at Pottsville to a point in Mount Carbon.

SHELBURNE FALLS, MASS.—At the annual meeting of the stockholders of the Heath Telephone Company it was voted to authorize the directors to execute a lease of the lines and property of the Deerfield Valley company, a sublicensee of the New England company, and arrange with the latter for long-distance connections, provided satisfactory terms can be made. The following directors were elected: W. E. Kinsman, F. L. Totman, A. J. Patterson, F. H. Smith, W. A. Barber, C. S. Goodwin and H. Newell.

TROY, N. Y.—At a meeting of the stockholders of the Buskirks & South Cambridge Telephone Company Amos Broughton was elected chairman and George Cornell secretary. The report of the treasurer showed a balance on hand of $235. The following directors were elected for the ensuing year: Edward Whiteside, Edgar B. Chase, G. Grant Rich, Charles King, Fred M. Dewey, Ira S. Durfee, Edwin T. Cornell, S. S. Sisson and Harmon Beadle. At a meeting of the directors Edward Whiteside was chosen president, Edgar B. Chase vice-president, Ira S. Durfee secretary and Fred M. Dewey treasurer.

INDUSTRIAL ITEMS.

THE LOMBARD GOVERNOR COMPANY, Ashland, Mass., in bulletin No. 110, gives brief descriptions of those types of Lombard governors which are most frequently used. In addition to the descriptive matter there is incorporated a series of letters concerning the satisfaction many prominent power-users have had in adopting these governors.

THE JEFFREY MANUFACTURING COMPANY, Columbus, Ohio, is distributing some attractive literature devoted to Jeffrey "Century" rubber-belt conveyers, conveying machinery for sawmills, lumber mills and wood-working plants, coal tipples and shaking screens (bulletin No. 22), and coal-washing plants and equipment (bulletin No. 27).

THE SPRAGUE ELECTRIC COMPANY, New York city, is distributing circulars Nos. 432 and 433, the former describing a new line of fittings for use with its flexible steel conduit, and the latter describing the new single-strip type of flexible steel conduit, designed especially for fireproof buildings. Copies of these circulars will be sent upon request.

THE GENERAL ELECTRIC COMPANY, Schenectady, N. Y., in circular No. 3702, describes its new Type CR feeder regulator and the benefits to be derived from the use of such apparatus in connection with alternating-current lighting systems. This regulator is designed for operation on single-phase, 220-volt, sixty-cycle circuit, and may be used with either hand or sprocket control.

THE PHILIPS METALLIC GLOW LAMP WORKS, LIMITED, Eindhoven, Holland, has published a very interesting bulletin describing the Philips metallic glow lamp. The filaments in these lamps are composed of fine pure metal, and the lamp is stated to have a life of 1,000 hours. The lamps are made suitable for burning in any position, and a special form of packing insures against breakage.

MURALT & COMPANY, New York city, have secured the contract for the enlargement and improvement of the hydroelectric plant of the Riverhead Electric Company, of Riverhead, Long Island. The old water-wheels now in use will be taken out and new Trump turbines of the vertical-shaft type will be installed. The electrical equipment will be of the three-phase, alternating-current type, with a frequency of sixty cycles, operating at 11,000 volts. There is also an auxiliary steam plant for emergency purposes.

THE KELLOGG SWITCHBOARD AND SUPPLY COMPANY, Chicago, Ill., has issued a folder describing and illustrating its new push-button intercommunicating telephone system. Five views showing wall and desk-set styles, both open and closed, are given. The accessibility and rigidity of these sets are clearly shown in the illustrations of the open views. Both wall and desk sets are finished in either oak or mahogany, and are made up very attractively. Copies of this folder will be sent to any one interested upon request.

THE WARD LEONARD ELECTRIC COMPANY, of Bronxville, N. Y., announces that its catalogue A3 and catalogue A4, covering Ward Leonard navy-type motor-starting panels, fulfilling specifications of the Bureaus of Construction and Repair, Equipment and Steam Engineering, Nos. 2 M1, 1906, should not be used in quoting upon the latest specifications dated 1907 and 1908 of the Navy. Enclosing cases for panels are specified in these latest specifications, and several minor changes. Until the company's new bulletin is issued, customers should write for special quotations.

THE CINCINNATI MILLING MACHINE COMPANY, Cincinnati, Ohio, is distributing a catalogue devoted to high-power millers. This catalogue illustrates an entirely new line of horizontal and vertical milling machines. The machines are built on the unit system, each group of mechanisms being assembled as a complete unit. All the units are interchangeable between the horizontal and vertical machines. This makes it possible to supply these machines not only with constant-speed drive, but with right-angle drive, constant-speed motor drive and variable-speed motor drive. A change from one style of drive to another is easily made.

THE STANDARD GAUGE MANUFACTURING COMPANY, which has been actively engaged in the manufacture of indicating and recording gauges at Syracuse, N. Y., will move its plant and main office to its new factory at Foxboro, Mass., on or

about November 1. Through this change the manufacturing capacity will be greatly increased, since the two main buildings alone have available floor space of one hundred thousand square feet, besides separate buildings for the foundry, blacksmith shop, carpenter shop and power plant. The growth of the Standard Gauge Manufacturing Company has been steady since its inception in 1899, so that this epoch in its development will not surprise its many patrons. The sales offices addresses will be as heretofore: New York, 1770 Hudson Terminal, Fulton Building, and Chicago, 725 Monadnock Building.

Record of Electrical Patents.

Week of October 20.

901,322. ELECTRICAL ACCUMULATOR. Charles Busch, New York, N. Y. Filed July 15, 1908. The active surface is held by burs on adjacent perforated electrodes, and an elastic binder holds the electrodes together.

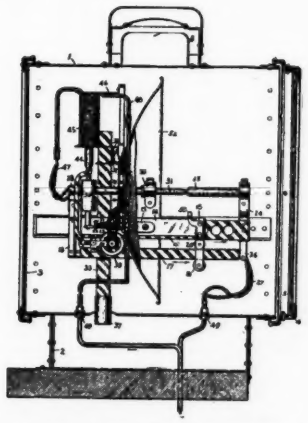
901,331. ELECTRIC RAILWAY SIGNAL. Edward A. Everett, Detroit, Mich. Filed June 27, 1906. The circuit is closed by means of a liquid conductor, and means are provided to open the contact should the fluid conductor fail.

901,332. INSULATING MATERIAL. Willis E. Everette, Tacoma, Wash. Filed May 17, 1906. The material is formed of insoluble fireproof threads composed of calcium, aluminum, silicon and oxygen.

901,336. AUTOMATIC ELECTRIC LIGHTING SYSTEM. Carl J. Gardeen, Columbus township, Anoka County, Minn. Filed December 5, 1907. The system includes a storage battery, a battery for an ignition system, a generator which may act as a motor by reversing the polarity of the armature, and circuit-closing and regulating switches.

901,341. ALTERNATING ELECTRIC-CURRENT MACHINERY. Alexander Heyland, Brussels, Belgium. Filed May 2, 1903. A commutator is provided for simultaneously commutating and decomposing a portion of the current.

901,368. APPARATUS FOR MAGNETIC SEPARATION. Clarence Q. Payne, Stamford, Ct., assignor to the International Separator Company. Filed October 3, 1903. The rotating cylinder is composed of alternately disposed magnetizable laminæ, and revolves in a magnetic field.



901,432.—Arc Lamp Headlight.

901,372. TELEGRAPHY. Louis M. Potts, Baltimore, Md., assignor to the Rowland Telegraphic Company, Baltimore, Md. Filed March 9, 1907. The constants in one circuit are balanced until the constants in a plurality of circuits are brought into equilibrium.

901,377—901,378—901,379—901,380—901,381—901,382—901,383. ELECTRIC RAILWAY SYSTEM. William Robinson, Brooklyn, N. Y. A series of patents embracing broad claims for an electric railway system, employing both direct and alternating currents, signal and relay systems, and means for insulating against the propulsion current sections of the track other than that occupied by the train in motion.

901,393. DEVICE FOR TESTING CANS. Charles W. Sleeper, Lancaster, N. H. Filed April 25, 1908. An incandescent lamp is placed in the bottom of the receptacle.

901,397. APPARATUS FOR RECORDING AND REPRODUCING BY THE TELEGRAPHONE PRINCIPLE. Harve R. Stuart, Wheeling, W. Va. Filed March 2, 1908. The telephone diaphragm imparts movement to a vibratory shaft which energizes reciprocal electromagnets.

901,422. CONNECTOR FOR ELECTRICAL CONDUCTORS. Frank B. Cook, Chicago, Ill. Filed April 2, 1908. The external surface of a tapered one-piece sleeve is threaded to engage with nuts gripping the strands over a wedge piece.

901,423. SWITCH FOR CHARGING AND DISCHARGING STORAGE BATTERIES. James H. Cormick, Belleville, N. J., assignor to the Union Switch and Signal Company, Swissvale, Pa. Filed February 29, 1908. Means are provided upon one panel for effecting different connections.

901,424. ELECTRICALLY CONTROLLED SWITCH. Archibald S. Cubitt, Schenectady, N. Y., assignor to General Electric Company. Filed April 22, 1908. Means are provided for varying the permeability of the current-carrying coil.

901,427. VAPOR ELECTRIC APPARATUS. Leonard E. Dempster, Schenectady, N. Y., assignor to General Electric Company. Filed October 31, 1904. The conductor is embedded in a radiating sleeve consisting of a vitreous material.

901,432. ARC LAMP HEADLIGHT. Richard Fleming, Lynn, Mass., assignor to General Electric Company. Filed June 16, 1905. The electrodes and arc-lamp carriage are supported on horizontally disposed rack rods.

901,440. DYNAMOELECTRIC MACHINE. Arthur L. Hadley, Fort Wayne, Ind., assignor to General Electric Company. Filed May 14, 1906. The field pole has a central section of laminæ interposed between two side sections.

901,441. SELECTIVE SIGNALING SYSTEM. Orlando W. Hart, Fall River, Mass. Filed August 10, 1907. A transmitting device is provided with means to cause a signal to become set.

901,445. PRIMARY BATTERY. Karl Heintz, Munich, Germany, Filed December 26, 1907. A galvanic cell of the Bunsen type with a sulphuric-acid solution and a nitric-acid solution separated by means of a carbon diaphragm.

901,448. FUSE HOLDER. Bryson D. Horton, Detroit, Mich., assignor to Horton-Massnick Company, Detroit, Mich. Filed August 29, 1904. A spring making indication on the exterior of the fuse is attached to the fusible material.

901,477. ELECTRIC RAILWAY SYSTEM. William Robinson, Brooklyn, N. Y. Original application filed July 20, 1904. The working conductor is formed in independent sections, and the power-current feeder is normally disconnected therefrom.

901,479. ELECTRIC PROTECTIVE APPARATUS. Charles A. Rolfe, Adrian, Mich., assignor, by mesne assignments, to Rolfe Electric Company, Rochester, N. Y. Filed April 20, 1903. A non-conducting softenable material is placed in combination with circuit-controlling, spring-actuated devices.

901,497. CARBON ELECTRODE. Joseph T. Szek, London, England. Filed September 23, 1907. The electrode is provided with longitudinal grooves throughout its length and a transverse groove at its base.

901,498. CONDENSER. Elihu Thomson, Swampscott, Mass., assignor to General Electric Company. Filed May 5, 1904. The dielectric sections are graded.

901,499. COMBINED MOTOR AND COMPRESSOR. Charles P. Tolman, New York, N. Y., assignor, by mesne assignments, to the Roteng Manufacturing Company. Filed November 16, 1905. The motor and compressor are mounted on a mechanically continuous shaft.

901,506. VAPOR ELECTRIC APPARATUS. Willis R. Whitney, Schenectady, N. Y., assignor to General Electric Company. Filed October 31, 1904. A metal tube forming one electrode is sealed about the other electrode.

901,509. SWITCH FOR CHARGING AND DISCHARGING STORAGE BATTERIES. Asbury G. Wilson, Wilkinsburg, Pa., assignor to the Union Switch and Signal Company, Swissvale, Pa. Filed February 28, 1908. Two pairs of discharging knives in combination with two pairs of clip contacts pivotally supported.

901,512. RHEOSTAT. Paul H. Zimmer, Schenectady, N. Y., assignor to General Electric Company. Filed May 20, 1907. The controlling arm is spring-pressed toward its initial position, and a circuit-controlling element is independently spring-pressed and arranged to hold the spring pressure from the said arm.

901,513. INDUCTION-MOTOR CONTROL. Ernst F. W. Alexanderson, Schenectady, N. Y., assignor to General Electric Company. Filed July 12, 1906. Means are provided for connecting the primary windings of two polyphase induction motors in parallel with one phase connected to the source, and means for connecting either motor mechanically to the load.

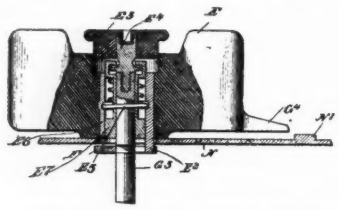
901,514. SYSTEM OF MOTOR CONTROL. Hans Alexander, Berlin, Germany, assignor to General Electric Company. Filed May 20, 1907. Means are provided for controlling the field strength of the generator to vary the voltage supplied to the motor.

901,529. ARC LAMP. Richard Fleming and Cromwell A. B. Halvorson, Jr., Lynn, Mass., assignors to General Electric Company. Filed May 16, 1904. The electrodes are given a somewhat violent engagement at intervals in the operation of the lamp.

901,540. COMBINED ELECTRIC ALARM AND LIGHT. William A. Lindsey, Narberth, Pa. Filed July 18, 1907. A relay-controlled lamp system is interpolated in the alarm circuit.

901,570. TELEPHONIC TRANSMITTER. Frederick G. Warrell, Lansdowne, Pa., assignor to the Euelectric Company. Filed October 3, 1907. The loose material occupies all the space between the vibrating diaphragms.

901,593. OUTLET BOX. Harry A. Coffin, Malden, Mass. Filed January 12, 1907. Means are provided for limiting the vertical movement of the bushing and covering plate.



901,630.—Operating Means for Circuit-Controlling Devices.

901,613. ELECTROMECHANICAL REGULATOR FOR ELECTRIC TENSION. Joseph M. C. Herrgott, Valdole, France. Filed April 27, 1906. The solenoid-operated plunger is assisted by the action of pneumatically or fluid-controlled valves.

901,614. CIRCUIT-BREAKER. Edward M. Hewlett and Theodore E. Button, Schenectady, N. Y., assignors to General Electric Company. Filed October 22, 1904. The circuit-breaker is provided with a scale and means for indicating the adjustment of the armature on the scale.

901,627. INSULATOR. Royal T. Langlan, Boston, Mass. Filed December 10, 1907. The two separable sections have abutting faces, one section constituting a spacer and the other being formed to enclose the lower end of a bolt.

901,630. OPERATING MEANS FOR CIRCUIT-CONTROLLING DEVICES. Julius K. Lux, Washington, D. C. Filed July 31, 1906. Means are provided to allow the indicator to rotate independently of the switch when power in excess of a predetermined amount is applied thereto.

901,649. SPACE TELEGRAPHY. Oscar C. Roos, Newton, Mass., assignor to Stone Telegraph and Telephone Company, Boston, Mass. Filed June 10, 1907. An elevated conductor has a parallel branch circuit connected in series therewith, containing capacity and inductance in each of its branches.

901,668. SAFETY APPARATUS FOR RAILWAYS. Samuel L. Adelson, New York, N. Y., assignor of one-half to Maurice Adelson, New York, N. Y. Filed March 18, 1908. The track apparatus is arranged in blocks, and the alarm is carried in the car.

901,669. MULTIPARTY-LINE TELEPHONE-EXCHANGE SYSTEM. Garrison Babcock, Rochester, N. Y., assignor to Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y. Filed August 4, 1904. A normally open passing contact switch at the substation is adapted to momentarily close the circuit upon depression of an associated receiver hook.

901,672. MULTIPLE-SWITCHBOARD JACK. Jules A. Birsfield, Rochester, N. Y., assignor to Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y. Filed February 13, 1905. The bending of the switch spring affects the bending area of the supporting shelf.

901,683. SUPERVISORY SYSTEM. Merritt S. Conner, Chicago, Ill., assignor to Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y. Filed March 5, 1904. In a supervisory signal an armature is provided, absolutely controlling a circuit through the said signal.

901,684—901,685—901,686—901,687—901,688—901,689. TELEPHONE-EXCHANGE SYSTEM. Merritt S. Conner, Rochester, N. Y., assignor to Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y. A series of patents covering various features of a telephone-exchange system.

901,696. TELEPHONE-EXCHANGE SYSTEM. William M. Davis, Chicago, Ill., assignor, by mesne assignments, to Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y. Filed April 26, 1901. A combination with a telephone switch hook at subscriber's station for opening and closing the telephone circuit thereat.

901,698. AUTOMATIC TELEPHONE-EXCHANGE SYSTEM. Bert G. Dunham, Chicago, Ill., assignor to Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y. Filed October 5, 1904. An automatic telephone system.

901,704. RECEIVER. John S. Goldberg, Chicago, Ill., assignor to the Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y. Filed November 23, 1903. The casing consists of a continuous one-piece shell of magnetic material, of which diametrically opposite regions are oppositely polarized.

901,738. SUBSCRIBER'S TELEPHONE CIRCUIT. Howard M. Post, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, Chicago, Ill. Filed July 31, 1905. The path for the signaling circuit contains the coils of a suitable ringer.

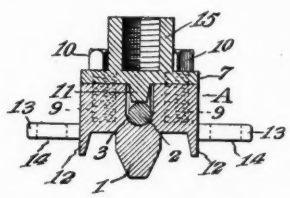
901,758. ELECTROLYTE. Abraham Van Winkle, Newark, N. J., assignor to the Hanson & Van Winkle Company, Newark, N. J. Filed October 24, 1907. The electrolyte comprises fluoride of zinc in solution.

901,765. MAGNETIC SEPARATOR. Reuben I. Wright and Homer E. Frost, Cleveland, Ohio, assignors to the Electric Controller and Supply Company, Cleveland, Ohio. Filed May 10, 1907. Mechanical connections with the valve-operating mechanism close the switch contacts prior to the opening of a hopper valve.

901,785. TELEPHONE SYSTEM. Elmer R. Corwin, Chicago, Ill., assignor to Corwin Telephone Manufacturing Company, Chicago, Ill. Filed December 26, 1906. A multiple selectively controlled telephone-exchange system.

901,816. TROLLEY-WIRE ANCHOR. Allan McIsaac, Hartford, Ct. Filed March 4, 1908. A horizontal plate-like bridge-piece has a tongue extending into a reciprocal groove for gripping the wire.

901,847. ELECTRIC MAIL-DELIVERING AND COLLECTING MACHINE. Otto E. Stout, Ozark, Ill. Filed June 30, 1908. The combination of a trackway and a motor-driven movable carrier.



901,816.—Trolley-Wire Anchor.

901,850. TELEPHONE-RECEIVER HOLDER. George J. Thomas, New York, N. Y. Filed August 14, 1907. An arm is pivotally mounted upon the bifurcated portion of a telephone-receiver holder.

901,861. TELEGRAPHIC SOUNDER. Vincent C. de Ybarrondo, Los Angeles, Cal. Filed May 6, 1907. An attachment comprising a U-shaped metallic member in combination with a hammer.

901,869. PROTECTOR FOR TELEPHONE TRANSMITTERS. Josef Baumgarten, New York, N. Y. Filed January 18, 1908. The mouthpiece is furnished with a collapsible funnel of flexible material.

901,871. ELECTRIC HEATER AND DRIER. George N. Blanchard, San Francisco, Cal., assignor of one-half to the Electric Manufacturing Company, San Francisco, Cal. Filed February 21, 1908. The air is discharged through a pyramidal electric resistance fixed within a tube.

901,878. TROLLEY-WHEEL BEARING. William M. Caswell and Joseph A. Schofield, Warren, Pa. Filed December 16, 1907. The bearing comprises fixed and hinged sections.

901,885. ELECTRIC CONTACT SPRING FOR TROLLEY HARPS. Albert L. Cole, Auburndale, Mass., assignor to United Copper Foundry Company, Boston, Mass. Filed September 28, 1905. A normally compressed washer portion is expansible both radially and transversely.

901,894. INDICATOR FOR TELEPHONE CALLS. Eugene T. Ducharme, Boston, Mass. Filed November 15, 1907. An indicator disc is carried upon the clapper arm.

901,899. ELECTRIC SIGNALING SYSTEM FOR RAILWAYS. William J. Higgins and Christopher J. Sheridan, Buffalo, N. Y. Filed December 27, 1907. A motor actuates the danger-signal semaphore arm in combination with secondary coils mounted upon the car.